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CONGRESS IN SESSION

- **H.R.1000 To amend title 49, United States Code, to reauthorize programs of the Federal Aviation Administration, and for other purposes.**

Introduced March 4, 1999, by Bud Shuster (R-Pennsylvania) and signed by President Clinton, April 5, 2000, as Public Law No: 106-181. This Act may be cited as the "Wendell H. Ford Aviation Investment and Reform Act for the 21st Century."

(a) IN GENERAL- Subchapter I of chapter 417 (as amended by section

(Legislation cont'd p. 20)

ALSO IN THIS ISSUE...

The Triple A Approach to Ensuring Animal Welfare

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Russell and Burch's (1) Three Rs (reduce, refine, replace) provide the framework for reducing animal pain and distress in biomedical research. Replacement has, perhaps, gained the most attention because activist groups targeted toxicity testing in animals. However, toxicity testing represents only a small percentage of research involving animals. Refinement, on the other hand, has the greatest potential to reduce animal distress and/or pain due to experimental procedures and frequently reduces the number of animals used.

Good experimental design defines the variables of interest. All remaining parameters remain the same in order to isolate and assess the specific variable(s) of interest. Fundamentally, the experimental design is at risk of compromise if confounding variables are introduced through poor animal well-being. These unintended consequences (either physiological, psychological, or both) affect the scientific data collected and thus should be avoided as much as possible. Avoiding such unintended effects on animal well-being involves much more than selection of the appropriate anesthetic or analgesic; good experimentation demands employing strategies that minimize factors that would direct physiological (and psychological) responses from the norm. Attention given to refinement from this point of view will also result in other benefits such as strengthening the scientific data (less inter-animal variability) and should also lead to reduction in numbers of animals used because animal morbidity and/or moribundity usually lead to greater numbers of animals needed to reach the scientific objective.

In this article, I use the term "refinement" in the sense of finding methods to relieve potentially painful or distressful procedures. I will focus on refinement of protocols in which the animals may not show overt signs of pain or distress as typically defined but may be considered abnormal because of the experimental disease that is part of the experiment. For example diabetes mellitus, induction of tumors, anemia, etc. are diseases that would be treated clinically but under experimental protocols, it may only be possible to alleviate symptoms. Because it is difficult to determine if an animal feels pain or distress, we (the veterinary and scientific staff) try to assess various procedures for their potential to disrupt the animal's physiological responses. The problem with assessment is lack of specific indicators of pain and the subjective nature of the assessment system. The clinical signs used in our facility to assess the condition of the animal were assumed to indicate early clinical disease; therefore, intervention strategies were expected to stabilize or slow progression of disease. We have no reliable indicators of pain or distress and are left solely with clinical assessment. It is our contention that early intervention and treatment of clinical signs does refine the study from both the viewpoint of the animal and the investigator. Daily observation, assessment, and intervention allow animals to remain stabilized longer, gain weight, regain bladder function, etc. For the investigator, such treatments allow experimental groups

Table 1. Grading system for clinical assessment of EAE

EAE GRADE	CLINICAL SIGNS
0	Normal mouse; no overt signs of disease
1	Limp tail or hind limb weakness but not both
2	Limp tail and hind limb weakness
3	Partial hind limb paralysis
3	Complete hind limb paralysis
5	Moribund state; death by EAE; sacrifice for humane reasons

(Coligan, J.E., A.M. Kruisbeek, D.H. Margulies, E.M. Shevach, W. Strober (1997). Animal Models for Autoimmune and Inflammatory Disease In Current Protocols in Immunology, Wiley & Sons, vol.3, chapter 15

to remain intact until the endpoint of the study without compromising study objectives. Before our staff began such a system, a large percentage of animals had to be euthanized because of complications from the disease before reaching the study endpoint, which frequently necessitated replacement animals.

At NINDS, in developing assessment strategies, we believe it is important that the scientist and veterinarian form a partnership because, to be successful, it must be a dynamic process. As each partner gains experience with the animals' responses to the experimental manipulations, we are better able to refine our intervention strategies, predict earlier intervention points, and apply our experiences to other similar protocols. We stress that the process is dynamic because we are rarely able to precisely predict how an animal model will behave. As the adage about hindsight suggests, only through experience are we able to clearly see errors made in our predictions of animal response in early stages of experimental design. However, rather than wait until a study is ended and reviewed, we believe making adjustments on intervention strategies and treatments can lead to better outcomes for both the animal and the scientist. We do not attempt to detect distress or pain—rather we rely on our knowledge of the animal's normal behavior and decide that any observations that deviate from normal behavior indicate the need for some type of intervention. In order for assessment to work, it is essential that the evaluators know normal physical appearance and pattern of behavior of the species in a study. In fact, it is often an investigator's lack of knowledge of the animals' normal behavior that can lead to disagreement in early phases of constructing assessment charts. However, in our experience, directly involving the investigator in animal observations quickly builds confidence in the partnership to correctly interpret an animal's overall condition.

Admittedly, judgments are subjective for the most part; however, as one gains experience with the animal model, acuity increases. A comatose or moribund state in itself may not be painful or distressful to the animal but earlier signs may have been missed. We collect both objective and subjective data to assess the animal's well-being. Examples of objective data are temperature, body weight, blood and urine glucose, blood pH, respiratory pattern etc; examples of subjective data are appearance, posture, and response to stimuli.

We suggest that there are two phases to the study: a planning phase in which the *approach* is defined and an execution phase in which the chosen approach is continually *assessed* and *adjusted* (our 3 A's). The sum of these activities results in assurance that we are eliminating or mitigating as much animal distress and/or pain as possible.

Table 2. Clinical Assessment of EAE

EAE GRADE	CLINICAL SIGNS	INTERVENTION ACTION
0	No abnormality	None
1	Initial signs but no paraparesis: clumsiness, incontinence or atonic bladder, or flaccid tail.	Note cage number on chart, weigh the mouse.
2	Mild paraparesis: trouble initiating movement but walk well once started	Continue to monitor visually, weigh the animal(s), if indicated.
3	Moderate paraparesis: inability to move one or both hindlegs, possible atonic bladder, noticeable gait disturbance.	Food and water more accessible (feed pellets and fruit placed on floor of the cage), express urinary bladder, if needed, weigh 3 times weekly, euthanize if ≥ 20 percent weight loss.
4	Moderate quadriparesis/quadri paralysis	Euthanize, unless investigators implement a plan for at least twice daily gavage and SQ fluid administration, with a medical record kept on each individual animal, express urinary bladder daily.
5	Moribund	Euthanize

Assessment of discomfort in an animal model of experimental autoimmune encephalomyelitis

In one noteworthy example, we had the opportunity to assess the degree of possible discomfort in a mouse model of experimental autoimmune encephalomyelitis (EAE) , which creates an acute phase followed by relapses with intervening periods of remission due to lesions in the brain and spinal cord (demyelination and inflammation). Following the acute phase, which is fairly synchronous among mice injected on the same date, relapses occur on different days (asynchronous), often resulting in an underestimate of clinical severity.

Depending on a study's objectives, investigators may assess differences between day of onset, mean peak of disease onset, number of relapses, and mean clinical scores. During initial review, investigators did not provide an assessment intervention chart for the clinical course of disease. Rather, they provided a clinical grading scale that had been previously published to objectively measure severity of disease (table 1). The veterinary staff wanted a different chart that we could use as a guide to provide nursing care interventions or determine if euthanasia endpoint criteria existed. Concerned that the categories were too general to prove useful from a veterinary viewpoint, we met with the investigators to develop a mutually acceptable grading scheme that would meet study objectives, establish guidelines for intervention, and not interfere with study goals. Initially, this idea met with resistance. Concerns of the investigators were that we would be overzealous in our assessment and euthanize animals without discussion or we would choose inappropriate (for the study) drugs to treat animals. After discussion, an agreement was reached that resulted in table 2. The veterinary staff agreed

Triple A cont'd on p. 20

ANIMAL WELFARE ISSUES Responsible Care And Health Maintenance Of Fish In Commercial Aquaculture

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Production agriculture has enabled the United States to become the best fed society in the world and is vital in domestic and international trade. An important segment of production agriculture, livestock production, has successfully provided consumers with a low-cost, wholesome protein source. Consumers have dictated low prices and high quality. Consequently, to maintain competitiveness, producers have set management objectives that maximize production while minimizing costs. In addition to public concerns about cost and wholesomeness of animal products, there is growing concern for the well-being of the animals while in the care of the producers. Most animal farming systems are designed to maximize production; however, proper care and good husbandry practices are linked not only with high productivity, but also with animal health and well-being. Producers must make a conscious effort to ensure the well-being of animals in their care. The argument is often made that attention to animal welfare can adversely affect profitability. In most systems, however, improved health and well-being translate into better animal performance. Both animal welfare and environmental quality protection are the responsibility of producers, and appropriate management inputs should be factored into production costs. If production costs increase significantly, the consumer will either have to pay higher prices or face limited supplies caused by producers being forced out of business.

Aquaculture, the raising of animals or plants in an aquatic environment, has received considerable attention during the past two decades as an alternative farming practice. Aquaculture has enabled society to enjoy fish for food, pets, and recreation and contributes to the preservation of certain threatened aquatic species. Concurrent with aquaculture development, concern for the welfare of the animals grown in aquatic systems has become an increasingly important issue with certain segments of society. The goals of the aquaculturist and concerns over animal welfare are not necessarily at odds. With careful planning and proper management, fish can be cultured to meet production and profit goals while maintaining aquatic animal health and well-being.

Both the general public and the producers must understand the needs and health status of the animals being produced. However, concern should be based on scientific facts about the animals' well-being and not solely on perceptions. It is generally easier to identify with the welfare needs of animals that are more closely related to humans, such as primates and other mammals. Understanding of the well-being and care of lower vertebrates, such as fish, is usually less. Assessment of animal well-being should be based on subtle behavioral and physiological changes as well as established environmental limits.

The number of aquatic species is vast and their needs vary greatly; here we mainly discuss finfish. New species of fish from the approximately 20,000 species worldwide are being evaluated and adopted as candidates for aquaculture. The optimum health requirements for major farm-raised species are known. However, requirements for other species are being determined by ongoing research that aims at defining the unique limits of each. Consequently, the amount of information available concerning health requirements varies considerably depending on the species. An understanding of the health requirements for a species increases with the length of time it is commercially cultured and its economic importance. We know much more about how to evaluate the well-being of traditionally grown species, such as channel catfish, goldfish, fathead minnows, golden shiners, and rainbow trout than we do about newer aquaculture species.

This article is intended to provide aquaculture producers and the general public with scientifically based information on which to base procedures for the care and husbandry of aquatic animals raised in commercial production systems.

Finfish Aquaculture Classifications

Finfish aquaculture is commonly classified according to (1) consumer use of the farm-raised product or (2) the environmental requirements of the fish being produced.

Consumer use

- The largest group based on consumer use is food fish, with the goal being a wholesome food product for human consumption.
- Another category is baitfish, with the goal of producing a fish that is healthy when it reaches the user (sports fisherman).
- Ornamental fish for pet markets are also produced on aquaculture farms. Appearance and health of these fish are very important.
- Fish are also grown for restoration and mitigation of wild populations. The goal is to replenish fish stocks for recreational fisheries or to supplement stocks of threatened or endangered spe-

cies. Maintaining a diverse gene pool is important to help ensure the long-term survival of the stocks when they are released into the wild.

Environmental requirements

Aquaculture classifications based on the environmental requirements of the fish being cultured commonly use the criteria of water temperature and salinity. Each classification has an optimal range of environmental conditions where a fish species thrives and a larger range where they survive.

- Categories based on temperature tolerance include coldwater, coolwater, warmwater, and tropical fish species.
- Salinity categories consider tolerance and restrictions based on the ionic strength of the water. These categories include saltwater, freshwater, and brackishwater fish species. Some fishes, such as anadromous species (having a portion of their life cycle in both fresh and salt water), are comfortable in a wide range of salinities and may appear in more than one category.

While these classifications are somewhat arbitrary, they are helpful when discussing basic environmental requirements and the well-being of fish grown in different aquaculture settings.

Production Systems

Regardless of the type of aquaculture based on the previous classifications, fish can be cultured in many different systems. Each type of system can have different effects on cultured animals. To address the management inputs required to maintain the health and well-being of the fish within a system, it is important to understand the type of system in which the fish are grown. Each of these systems has specific sets of conditions that can be controlled by the producer, resulting in a graded level of management responsibility.

Pond Culture

Pond systems may be classified by the level of intensification or the degree of management necessary to produce the quantity and quality of fish desired. The least intensive system offers the producer few control options, and management requirements are low. Management inputs include stocking and harvesting control to establish a balanced relationship between predator and prey species (for example, a bass and bluegill sunfish pond). The major management strategy is to control the species ratios of the original stocking and to control subsequent harvests. The productivity of fish in the culture system depends on the natural fertility of the pond.

The next level of intensification involves use of inorganic fertilizer, consisting of nitrogen, phosphorus, and potassium (NPK). Management efforts are similar to those described previously, but now the fertility and production of the pond are enhanced. The fertilizer increases production of plants (primary productivity) and of the small aquatic animal life that feeds on these plants. This increased food supply results in as much as a fivefold increase in fish production.

The productive capacity of the system can be further increased through supplemental feeding. By providing commercial feed, the number and weight of fish per unit volume of water can be greatly increased. The factor limiting production is usually dissolved oxygen. Oxygen supply usually limits the total weight of fish to about 1,500 pounds per acre per year. While the weight limit varies by species, the likelihood of oxygen depletion increases as the total weight of fish increases. It is common at this level of intensification and management to grow a single species of fish. Stocking, reproduction, and feeding rates are managed to ensure that overpopulation or excessive fish weight does not create high-risk conditions.

Management at the next intensification level includes greater control of dissolved oxygen, with the objective of obtaining even higher production rates. This type of system may accommodatae 5,000 to 10,000 pounds of fish per acre, depending on the species grown and the availability of water quality management equipment. Greater inputs of feed cause increased production of waste products by the fish. If the dissolved oxygen is managed effectively, nitrogenous waste products produced by the fish usually become the next production- limiting factor. If stocking and feeding rates are not carefully controlled, the concentration of un-ionized ammonia and nitrites can increase to undesirable or dangerous levels. Nitrogenous waste becomes a limiting factor because of the limited capacity of the pond biota (primarily algae and bacteria) to convert the waste products into less harmful byproducts. The amount of nitrogenous compounds that can be effectively processed and removed on a daily basis in this type of system is about 3 pounds of nitrogen per acre per day. This translates into about 100 pounds of 32-percent protein feed per acre per day. These values can change with different climates, environmental conditions, and fish species.

All of the systems described thus far are pond culture systems that require little or no water exchange. They rely on physical, microbial, and/or photosynthetic processes to remove waste products released by the fish.

Intensive Culture

Other aquaculture systems for commercial and research use require specific management practices and typically contain aquatic stocks of high density. These systems are referred to as intensive culture systems. Fish density is usually expressed in number of fish or weight of fish per cubic foot of water and/or by the flow rate. These intensive culture systems require the highest degree of management, which is aided by system design. Intensive culture systems include net pens or cages, raceways, and recirculating systems.

Net pen or cage culture systems involve the stocking of high numbers of fish per cubic foot into enclosures placed in large bodies of water. Water quality management within the cage is one of the producer's main tasks. For good water quality, water must flow through the cage at a rate sufficient to remove the water containing the fish wastes and replace it with cleaner water containing suitable concentrations of dissolved oxygen. The next management task is to ensure that the fish are stocked at the proper density. This provides for adequate lateral swimming space and limits aggressiveness resulting from dominance behavior. Under good management, certain fish species (such as catfish) can be grown at densities as high as 10 pounds per cubic foot of enclosure. Another important management strategy is making sure that the fish are fed a complete diet — one that contains all the essential nutrients. The quality of the feed used in any intensive culture system is critical because the fish have limited access to natural food sources.

In raceway production, continuously flowing water provides fish with a high-quality environment. The water flows through the system and is discharged before the water quality

degrades. Fish density of a raceway system is determined by the flow rate and quality of the incoming water. Stocking rates are high in these systems, and the lateral swimming space requirements for each species has to be known. Water flow velocities must be maintained below a critical level to avoid excessive exercise, which can cause stress. Trout, for example, are commonly grown at densities as high as 2 to 3 pounds per cubic foot of water and catfish at 10 to 15 pounds per cubic foot of water without any adverse effects, if suitable water quality is maintained. Supplemental aeration and oxygen injection are commonly used to enhance production in raceways. Because water quality is controlled more by physical factors than biological factors, problems that result from environmental stressors are usually limited. Generally, problems in raceway systems are caused by system failure (reduction or cessation of waterflow) or the introduction of disease organisms into the facility.

Recirculating culture systems can be complex and are the most difficult aquaculture system to manage. The usual intent of this culture method is to limit new water inputs to about 5 to 10 percent replacement per day. The purpose of this control is either to control water temperature within a specific range or to limit water usage. The water that flows through the tank or trough is collected and filtered both mechanically and biologically to remove waste products before returning to the fish culture unit. Though the basic principle of this type of system is sound, backup systems are required to maintain water movement and quality within established critical limits. The most common problem with this type of system is biofilter overload or failure. Additionally, health management can be difficult because practical, legal applications of certain chemicals and drugs are constrained by unique functional features of the system. Most compounds that will control disease agents also have a detrimental effect on the bacteria that are responsible for removing or converting waste products to nontoxic forms within this system.

Fish And Their Environment

Sensory Reception and Response

The nervous system of fish is similar to that of birds, amphibians, reptiles, and mammals. Their central nervous system consists of a brain and spinal cord capable of receiving and reacting to external stimuli. The central nervous system receives information from the external environment via sensory organs and peripheral nerves. The information is processed in the brain or spinal cord, and the appropriate reactions to the stimuli are initiated. The nervous system transmits both voluntary and involuntary signals to control the action of muscles and glands. Upon stimulation, the nervous system and the endocrine glands integrate to control functions and processes such as feeding and digestion, reproduction, respiration, circulation, osmoregulation, growth, excretion, buoyancy regulation, avoidance behavior, disease resistance, and even body temperature.

While most of the endocrine and nervous system functions found in land animals are also found in fish species, there are important anatomical, physiological, and biochemical differences. A major difference between mammals and birds and most species of fish is that fish cannot control their body temperature. The temperature of a fish varies with the temperature of the water; thus also do its biochemical, physiological, and behavioral responses. While there is some variation, fish generally double their metabolic rate for each 10° C rise in temperature, within their acceptable range. This becomes important when assessing the health of fish that appear listless, a common response to low temperatures.

An understanding of how fish perceive their environment is helpful when managing their care properly. Fish are finely attuned to their environment by the senses of taste, touch, sight, smell, hearing, and additional senses unique to fish. Sense organs of fish are adapted for life in an aquatic environment and have many sensory structures and functions that differ somewhat or completely from those of land animals.

Sensory functions of fish can be grouped according to the type of physical or chemical stimuli that are detected. The detection of chemical stimuli by the senses of smell and taste may overlap because water is very different from air as a means of transport for chemical substances. Some fish have taste buds on their body that detect the taste of food at a distance. The sensitivity of detection increases as the fish gets closer to the food source. This allows them to locate food even under conditions when it cannot be seen. Fish also have sensory organs called nares, which are similar in structure and function to those in nasal passages of land animals, but it is the water rather than the air that carries the smell.

The perception of physical disturbances by fish is also different from that of higher vertebrates because the density of water is greater than that of air. Orientation and pressure recognition, along with buoyancy control, are important parts of a fish's physical sensory capacity. Hearing in fish is different from that in land animals because sound waves are received in a liquid medium, and there is no need for specialized structures to translate sound waves from the air to liquid (the ear drum). There is also little need for the external structures that are used in land animals to concentrate sound waves from the air. A fish's lateral line system, which is a sensing system for low-frequency pressure waves, can be thought of as "touch at a distance." This system provides fish with important information about food or predators while some distance away. Additional sensory capabilities in some species can recognize and react to very low levels of electricity. The organs that receive the electrical impulses from the water help the fish to find their prey and avoid predators. This can be important when considering the possible effects of stray electrical currents that can occur in fish culture units.

Sight in fish is similar to vision in land animals. Lens shape varies considerably among species, but the eyes are functionally similar. In some fish species, the small pineal gland in the brain has sensory function in light perception. This function is thought to be responsible for circadian rhythms (biorhythms based on a 24-hour cycle) that control maturation and spawning activity. These senses may require the regulation of light intensities and daily light/darkness regimes to avoid stress in fish.

We do not know the extent to which fish perceive pain as a sensory function. We do know, however, that when fish are presented with conditions that cause pain in humans, they display an avoidance behavior. Pain, as defined in Webster's New World Dictionary, is "a sensation of hurting or strong discomfort, in some part of the body, caused by an injury, disease, or functional disorder, transmitted through the nervous system." The difficulty in assuming similarities between what fish experience and what humans experience is based on our inability to find structures in fish that are similar to those known to sense pain in humans. It is also impossible to ascribe to fish the process of conscious recognition of pain so well developed in hu-

mans. While evidence that fish have pain receptors identical to mammals is disputed (Nickum 1988), their ability to identify irritants appears to be well documented. Thus it appears important to avoid conditions that cause a violent response from fish or more subtle physiological changes that are indicative of stress.

It is impossible for humans to understand completely how fish perceive and respond to their environment. Some differences that are not part of our own experiences are how fish perceive acoustical and electrical stimuli and their ability to taste the environment with external taste buds. Possibly even more difficult to understand is how fish perceive touch. An important question to answer might be whether fish have the ability or need to discriminate between tactile stimuli that humans describe as "pleasurable" or "painful." This question is certainly important when considering the well-being of higher vertebrates that have the ability to display their pleasure or discomfort. Because we do not understand the fish's perception, a prudent policy would be to assume that conditions that cause pain in higher vertebrates should be avoided with fish whenever possible.

Environmental Stress and Disease

Fish, like other animals, have both generalized and specific responses to prolonged or repeated exposure to less than favorable environmental conditions. In a manner similar to other vertebrates, fish respond with a specific set of biochemical and physiological changes that help them survive bad conditions. Some of the changes that occur when a fish is exposed to a stressor are similar regardless of the type of stressor. The types of stressors that can occur in aquaculture are chemical, physical, or behavioral. Because the net effect of a stressor is costly to the fish's energy, stressful environmental conditions become costly to the producer and may result in lower production efficiencies and a poor survival rate.

The overall effect of a stressor on an animal depends on the nature of the stressor and the degree and duration of exposure. Three recognizable stages are common in animals forced to tolerate sub-optimal conditions: a **stage of adaptation**, a **stage of recovery**, and/or a **stage of exhaustion**. The degree and duration of the stressor generally dictates the outcome of the stress event. If the stress event is limited, fish are often able to adapt to the conditions and reestablish normal function under the new set of conditions. If the stress is removed, fish will generally go through a process of recovery, where they reestablish normal function over a period of time. If the stress is too great for the fish to compensate through adaptation, the fish will enter the stage of exhaustion and eventually die.

Even if fish recover from a stressful experience, important physiological and immunological changes can cause the animal to become more susceptible to disease organisms. The response pattern of fish is less understood than that of mammals and birds, but its key elements are similar. The basic response of fish to a stressor or adverse condition is to adopt an emergency survival status. While some of the responses that occur have obvious benefits to the fish, such as mobilization of energy reserves, other responses appear to have negative effects on long-range survival, such as decreased immune function. It appears that when fish are presented with a stressor, they sacrifice long-term survival strategies to concentrate their efforts on short-term survival.

The overall effect of a stressful environment to fish stocks is reduced performance. Reduced performance may be measured in poor survival, poor feed conversion rates, poor reproduction, and poor feeding and growth. Thus, raising fish in sub-optimal conditions is not to the advantage of the aquaculturist. Understanding the environmental requirements of the fish species and providing proper care and health maintenance to avoid stressful conditions are the keys to the success of the producer and the well-being of the fish.

Responsible Management

The basic requirements for the well-being of fish that are raised in an aquaculture facility must be provided by the producer. While fish in the wild are capable of migrating and changing behavioral patterns to meet their needs, fish in an aquaculture facility often cannot seek out optimum or more suitable conditions. To provide fish with a healthy environment, it is important to have both a properly designed facility and a management plan that addresses the needs of the fish. Fish should be provided with their basic needs: sufficient lateral swimming space; good water quality; a nutritionally complete diet; limited physical disturbance; and careful, prudent handling. The producer should also have a health management program that focuses on both infectious and noninfectious diseases. The program should be based on sound information and a thorough understanding of environmental requirements of the fish species and the culture system.

Because there is so much diversity in culture species and culture systems, a responsible management strategy has to be developed for individual aquaculture operations. For example, the management inputs necessary for a less intensive pond system raising an environmentally tolerant species such as the common carp would be low. However, raising the more environmentally sensitive rainbow trout in a recirculating system would require a very high level of management input. Proper management is a requirement for achieving high fish performance in any culture system. A well-designed and properly managed aquaculture facility can produce fish consistent with production goals while maintaining the well-being of the fish.

Stocking Rates

The number of fish stocked in the culture unit is very important to production goals and the well-being of the fish. Enough fish must be stocked to meet production goals but not so many that management cannot maintain proper health. If stocking rates exceed the carrying capacity of the system, then management to maintain acceptable conditions may be impossible. The influence of stocking rate is expressed in two ways: (1) effects fish have on the environment, and (2) effects fish have on each other. Greater fish densities will result in greater release of waste products into the culture environment. To avoid water quality problems associated with stocking rates, the capacity of the system to remove waste products should be understood by the producer. The carrying capacity of the system is limited by reliable physical and biological processes that have the capacity to remove specific amounts of waste on a reliable basis. Stocking rates should match the quantity of fish to be produced with the carrying capacity of the system. Additionally, the producer should provide the equipment necessary to maintain a healthy environment, and the management necessary to ensure production goals and the well-being of the fish stock.

Assuming that the stocking rate is within the carrying capacity of the system, the next important consideration is fish interactions. Most fish species of commercial aquaculture are characteristically tolerant of the presence of other fish of their own

species. This is important in the selection of a candidate species for aquaculture. The lateral swimming space of high fish densities is most important in culture systems such as raceways, tanks, or cages. Depending on the species, limited swimming space may or may not cause stress. For example, catfish have been grown in cages in excess of 10 pounds of fish per cubic foot without a reduction in performance (Davis et. al. 1991). There is evidence that intermediate stocking rates of catfish (below 4 fish per cubic foot) results in fighting and injury. Thus, catfish raised in intensive systems should be stocked at rates that do not exceed the carrying capacity of the system and are above the threshold where fighting commonly occurs. Studies on coldwater fish (salmonids) have demonstrated that an elevated cortisol level (an indicator of stress in fish) depends more on dominance factors and interspecies fighting than on rate of stocking (Li and Brockman 1977).

A fish's natural behavior influences its density requirement. For example, adverse effects of crowding are often experienced with open-water pelagic species and predatory species, but occur infrequently with schooling or socially oriented fish. Consequently, naturally tolerant species are ones often selected for aquaculture. It is recommended that producers carefully investigate stocking rates to establish criteria that minimize aggression among cultured fish and maintain good water quality.

Water Quality

Management of good water quality is necessary to maintain good production and the well-being of farm-raised fish. Two sets of water quality conditions must be managed. The first set consists of factors that are generally provided within an optimal range for the culture species. Examples are dissolved ions (sodium, chloride, calcium, and bicarbonate), temperature, pH, and dissolved oxygen. The second set consists of water quality factors that, in excess, are potentially harmful to the fish and should be maintained below a specific threshold. This set can be divided into (1) external or introduced toxicants, such as heavy metals, pesticides, and supersaturated gases and (2) natural substances, such as ammonia, nitrites, carbon dioxide, hydrogen sulfide, and suspended solids.

To maintain the health of the fish in the culture unit, it is important to select a water source that meets the requirements of the fish. A culture unit's water supply will often limit the range of species that can be grown. Not only does the ionic content of the water determine the aquatic environment where aquaculture can occur (i.e., saltwater, brackishwater, or freshwater), it can also affect management practices. For example, in freshwater aquaculture, calcium, sodium, and chlorides are very important ions to fish physiology. If they are not present in concentrations high enough for the fish to efficiently utilize them from the water, then a fish can have osmoregulatory (salt water balance) problems. The dissolved ion complex of bicarbonate/carbonate is very important in management because its buffering capacity (total alkalinity) helps control changes in water pH. While all of the important ions can be added to aquaculture water supplies, cost and logistics of such additions make certain water sources impractical for aquaculture.

Temperature of the source water is also very important in selection of production sites. As mentioned earlier, temperature is important in classifying aquaculture systems. Species-specific temperature requirements also make certain climates and water sources preferred for optimal growth (table 1). While temperature of the water can be changed to meet the requirements of almost any fish species, the cost is often excessive. Rapid water temperature changes will also cause stress in fish. It is generally recommended to change the water temperature slowly at a rate of less than 3^{o} C per hour. This allows the fish to adapt to a new water quality condition.

Table 1. Preferred water temperature ranges for optimal growth for various fish species of different temperature classifications.

Temperature Classification	Fish Species	Optimal Temperature Range ^{o}C
Coldwater	Rainbow trout	7-13
Coolwater	Yellow perch	24-27
Warmwater	Channel catfish	28-31
Tropical	Tilapia	27-32

The type and concentration of dissolved ions in water must be compatible with the species of fish that are grown within the system. Salinity is a measurement of the ionic concentration of water, primarily sodium and chloride. The salinity of the water greatly affects the physiology of the fish being cultured. Waters can be broadly classified into three basic categories: saltwater — >20 parts per thousand (ppt); brackishwater — 5 to 20 ppt; and freshwater — <0.5 ppt. The strategy that different fish species have developed to maintain internal salt concentrations (osmoregulation) depends on the salt concentration of their natural environment. Saltwater fish have developed mechanisms that help to remove or exclude ions from internal tissues. Freshwater fish have developed mechanisms to concentrate or retain internal ions within their bodies. In fresh water, sodium and chloride should be maintained at a level of at least 10 parts per million (ppm) and calcium at 20 ppm for most fish species. Selection of a fish species that is compatible with the water source is necessary if fish are to be raised under healthy conditions.

The pH of the water in the culture unit should be maintained within a desired range (generally 5 to 9) for the health and well-being of the fish. The pH of the water is dependent on both the buffering capacity (usually total alkalinity) and the biological activity within the unit, including the fish. The buffering capacity of the water controls the degree of pH change in the water which is caused by photosynthesis and respiration. Photosynthesis by plants in the system removes carbon dioxide (the major source of acidity in most natural waters) from the water, causing the pH to rise. Respiration, on the other hand, adds carbon dioxide to the water, thus lowering the pH. The changes in pH that occur in the system are dynamic and can differ from hour to hour depending on conditions. As with other water quality conditions, maintenance of pH within the acceptable range must be considered during facility design and managed during production.

Possibly the most important management task of a producer is to maintain dissolved oxygen at acceptable levels (above 4-5 ppm). The level of management changes dramatically with the intensity of the culture system and is also affected by the fish species raised. There are two basic approaches to managing dissolved oxygen in aquaculture systems:

- passive management, and
- active management.

The **passive management** approach is to control stocking rates so that dissolved oxygen concentrations in the water do not reach critical levels (below 4-5 ppm). Oxygen can be managed by stocking and feeding fish at low levels, as with low intensive pond culture (feeding under 30 pounds per acre per day) or by designing a raceway system so adequate water replacement keeps dissolved oxygen at desired levels. The critical level depends on the species and their health status.

The **active management** approach is to introduce supplemental oxygen by mechanical or other means. There are many different designs and approaches, but all supply oxygen to the fish at a rate that will prevent stressful conditions. The two major strategies for supplying oxygen to the fish are, (1) aeration, where the diffusion of oxygen is mechanically enhanced, and (2) oxygenation, where pure oxygen is delivered into the water. Regardless of the method used, dissolved oxygen should be maintained at acceptable levels to ensure good production and the well-being of the fish.

Of the compounds that are directly toxic to fish, the types that come from sources outside of the system (external toxicants) are the most diverse. It is necessary to prevent the occurrence of these compounds in production systems by proper site selection, water source evaluation, selection of nontoxic materials, and avoidance of any harmful contaminants.

A second group of compounds that are toxic to fish are the compounds that are produced within the system. Some of these are released by the fish as metabolic byproducts (ammonia and carbon dioxide). Others are products of decomposition of the waste products, such as nitrites and hydrogen sulfide. A third group of compounds, produced by other organisms within the system, include bacterial and algal metabolites. Fish waste products are very soluble in water and quickly become incorporated into the water. Metabolites and their breakdown products become environmental problems for the fish if released in excess of a culture system's ability to convert them to harmless forms (table 2). When more fish are raised per unit of water, the release of metabolic wastes also increases. Fish cultured at high densities without proper waste management can cause poor water quality. This increases the risk that the water will become degraded to the point where fish will experience discomfort. The metabolic byproducts of primary concern are the nitrogenous compounds; of these, ammonia and nitrites are the most important. Proper management of waste products requires careful design of the system to ensure that the waste produced by the fish is disposed of in an efficient and environmentally sound manner. It is also important to stock fish within the waste disposal carrying capacity of the system so the system does not become overloaded. To maintain proper fish health, good water quality must be provided by source and system design and through proper management based on the needs of each species.

Table 2. Critical levels of naturally occurring waste products in fish culture.

Compound	Critical Level
Ammonia	>0.05 ppm NH_3-N
Carbon dioxide	>10 ppm
Hydrogen sulfide	>0.005 ppm H_2S-S
Nitrite	>20 percent of Cl^- concentration

Nutrition and Feeding

The complete dietary requirements for all commercial aquaculture species are not known. Generally, the longer a species has been raised in aquaculture, the more is known about its specific dietary requirements. Recommendations on the protein, energy, amino acids, essential fatty acids, vitamins, and minerals are published in the scientific literature and by the National Research Council (1983) for catfish and trout. While the feed manufacturer is usually responsible for providing feed of adequate quality, producers should know the nutritional needs of their fish. Nutritionally complete rations are required for fish reared in intensive culture conditions, while those grown in the least intensive conditions can consume more natural foods that contribute to their nutrition.

Feeding practices are also very important and can change with size and developmental stage of the fish. It is important to feed the fish on a prescribed schedule according to specific nutritional needs. The amount to be fed should be adjusted as the fish grow so they receive the proper quantity of feed daily. Additionally, temperature and water quality conditions that exist prior to and at the time of feeding can also affect feeding response. Feeding activity is a very important observation in management and is often the first indication that one or more problems exist with the fish or in the production system. Any sudden decrease in feeding activity not attributed to natural variation (such as a change in temperature) should be investigated immediately, because it is likely that management action is required.

Physical Disturbances

Because fish are so attuned to their environment, it is important that tranquility be maintained by minimizing physical disturbances. For indoor systems, this should include provisions for necessary photoperiod (daylight cycle) manipulation and no sudden changes in light intensities. Avoidance of loud or startling noises is important. Care should be taken to not disturb fish by casting shadows over them or tapping on tanks. Care should also be taken to prevent stray electrical currents in production units, especially with highly sensitive species. Restricted access should be maintained to facilities where fish are raised in tanks to prevent excessive physical disturbances. Fish can also be stressed by excessive water velocity in raceways; the critical swimming velocity should be investigated for the species being cultured in these systems. Studies with trout demonstrate that water pH of less than 5 and more than 10 has a negative effect on the maximum critical swimming speed (Ye and Randell 1990). The velocity of the water in a raceway should be set at a rate (usually expressed in body lengths per second) that will effectively remove wastes but does not over-exercise the fish. Excessive turbulence caused by water flow or aeration should also be avoided, especially when culturing very small fish.

Handling Fish

Handling and harvesting can cause some of the most stressful episodes in the life of a cultured fish. This is because during handling, fish are often restrained or confined for periods of time outside water and many times are held in suboptimal water quality conditions. It is therefore very important to handle fish as infrequently as possible and with great attention to proper handling practices. The proper salt content, temperature, and other water quality conditions should be maintained when fish are handled or transported. In some cases, approved anesthetics can

be used to reduce excitement of fish during transport. This can reduce fish metabolic rates and relieve stress. The addition of salt to transport tanks for freshwater fish can also reduce the effects of stress by improving the efficiency of salt balance mechanisms. Every effort should be made to minimize the amount of time that fish are restrained or held out of water.

Health Management

Disease management in aquaculture systems begins with creating and maintaining a good living environment for the fish. Proper design and good management are necessary to minimize health risks by reducing stress to the fish. Once the system is designed properly and the management practices are directed to reduce stress, it is important to minimize the contact of the fish with infectious disease agents. Prevention is the best approach for avoiding diseases, and management plans should include a vigorous health management program including quarantine, hygiene, health monitoring, and disinfection when appropriate. Treatments should be used only after a proper diagnosis of a treatable infectious disease has been made. Use only drugs and chemicals that are FDA-approved and proven to be safe and effective. Many disease treatments can have an adverse effect on the water quality within the system. Monitor water quality and be prepared to implement management action when necessary.

Disease Prevention

Disease prevention is an important part of any animal production system. Two aspects of prevention are especially important in a health management program.

- **Avoidance** — Do not allow fish to make contact with specific pathogens. The objective is to ensure that no obligate, contagious pathogens are introduced into the facility. Management includes control of inputs, such as water supply, equipment, personnel, fish feed, and live or dead fish.

- **Stress prevention** — Maintain the animal in a healthy and robust condition by preventing stress. Effective management of stress prevents and helps reduce the number of disease outbreaks caused by facultative pathogens, which can only become established when fish are predisposed by a stressor.

Good management practices minimize introductions of disease agents by recognizing their potential sources. The most common means of infectious disease entry is introduction of infected fish from contaminated sources. Screen new fish for important diseases that affect the species being raised. This can be accomplished in part by review of historical evidence provided by reputable suppliers and through inspection (Thoesen 1991). Quarantine the fish in an isolated portion of the facility for 4 to 6 weeks at a temperature that allows outbreaks of specific diseases. Do not share equipment with other facilities, and disinfect it between uses. Personnel should take preventive action before entering a facility or areas of a facility where they can potentially spread or carry harmful disease organisms. Buy feed from a reputable source and store it properly until used. These practices are general, but they will help reduce the potential of disease introduction into the production system or farm.

Summary

Aquaculture producers should use good management practices to ensure that the animals within the culture systems meet production goals and are cared for properly. Successful production and profitability require an understanding of the needs of the fish and the use of management practices that reduce stress. The most pressing task of new producers is to learn the specific requirements of the species selected and the limitations of their culture system and water sources. This task is easy for some commercial species and systems because of past commercial successes and available literature. For new species and new kinds of systems, however, the track record and scientific information are lacking. Prospective producers should learn as much as possible about the aquatic animal and the chosen production system. Making sure that the species selection is compatible with the culture system is the first ingredient necessary for success. The producer then must make a commitment to proper system design and management. If the information on a particular species and system is sparse, the venture will be risky to the producer as well as to the fish.

Development of procedures to ensure the well-being of farm-raised fish is a dynamic process that will require ongoing research to provide new information on how to successfully culture aquatic species with minimal stress. Stress prevention, which contributes to an aquatic animal's well-being, also improves the profitability of an aquaculture enterprise. Producers should pay close attention to ensuring, through proper management practices, maintenance of a suitable environment. Proper design and management of aquaculture systems can help ensure the well-being of the fish and production efficiencies. There are many excellent books available on the culture of aquatic organisms, design and management of aquaculture systems, water quality management, stress in fish, and health maintenance procedures. Consult with an aquaculture specialist on how to select a species and a system that has a high probability of success.

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Multi-language Film Features State-of-the-art Alternatives for Education

EuroNICHE—the European Network of Individuals and Campaigns for Humane Education—has produced a 33-minute video featuring state-of-the-art alternatives to animal experiments. The video offers a range of alternative methods for experiments traditionally used in anatomy, physiology, surgery, and pharmacology courses. The video includes computer simulation and learning packages, computer-linked human self-testing apparatus, waste organ surgical training apparatus, high-resolution video and a veterinary training model. Full details of the products and producers are available. Further alternative approaches for practical work requiring animal tissue are covered in the film with the sourcing and use of naturally-dead or euthanised animals, and clinical practice.

To promote its use, the video currently is being shown and distributed across Europe, the United States, Australia, and Japan to teachers and students of biological sciences, veterinary and human medicine, and to ethics committees, legislators and animal protection groups. The film is currently available in English, Czech, Slovak, Russian and Japanese. It will be available soon in French, Spanish, Italian, Hungarian, Ukrainian, and Romanian.

EuroNICHE is a non-profit, charitable network of students and teachers with contacts in more than 20 European countries, the United States, Australia and Japan.

The cost is £12 in Western Europe, £6 in Eastern Europe, $20 in the United States., and A$30 in Australia.

For more information, contact EuroNICHE coordinator Nick Jukes: tel +44 7867 513 215 (mobile), tel/fax +44 1892 548 462, e-mail: lynx@gn.ape.org. ■

Humane Society of the United States Pain & Distress Initiative

The public's perception that animals suffer in biomedical research and testing is a key factor fueling the controversy over animal experimentation. This public concern has brought about laws and regulations that specifically address laboratory animal pain and distress and call for efforts to limit or at least report when animal pain and distress occur. However, the identification and management of pain and distress in research animals are very complex issues that have received insufficient attention to date. To address the gaps in our knowledge of pain and distress, and to promote laboratory animal welfare, the Humane Society of the United States (HSUS) has launched an initiative to eliminate significant pain and distress in laboratory animals by the year 2020 by working with Institutional Animal Care and Use Committees (IACUCs) and scientists. While this is an ambitious goal, it is arguably within the ingenuity and skills of those who use and care for laboratory animals, and the scope and responsibility of the scientific community. More importantly, while not widely recognized outside the research community, most scientists and laboratory personnel support efforts to minimize pain and distress in laboratory animals.

To find out more about this program, visit the HSUS web site at
http://www.hsus.org/programs/research/pain_distress.html

AALAS Certification Exam Grant Program

Applications must be submitted before July 1, 2000.

DESCRIPTION/PURPOSE: This award is to help offset certification costs for AALAS members eligible to take exams at the ALAT and LAT levels. Sponsored by Washers, International, this award will be presented to one individual from each district at both the ALAT and LAT level (a possible total of 16 recipients per year).

APPLICATION CRITERIA
1.Candidate must be an AALAS National member at any membership level at the time of submitting the grant application.
2.Candidate must meet the requirements for certification at the time of submitting the grant application. Documentation of work experience and education on the Verification of Work Experience and Education Form must be included with the grant application.

APPLICATION MATERIALS
Three copies of each of the following items must be included as part of the application package.
1.A completed Grant Application Form.
2.Letter of Application stating what level of certification (either ALAT or LAT) you are interested in and why you feel the grant should be awarded to you. Please indicate your need for the grant, how you believe the grant and AALAS Certification will benefit you, and your preparation and readiness to take the exam.
3.A one page Letter of Reference from a current AALAS National member of your District supporting your application.
4.A completed Verification of Work Experience and Education Form

The entire application package (to include 3 copies of items 1-4 above) should be sent to the AALAS National office should be sent to the AALAS National office and must be postmarked no later than July 1 of the year in which the grant is requested. For more information contact American Association for Laboratory Animal Science, Attn: ATCB Exam Grant, 9190 Crestwyn Hills Drive, Memphis TN 38125, phone: (901) 754-8620, fax: (901) 753-0046. Complete information and forms are available at http://www.aalas.org Look under Washer's International. ■

Alternative Methods Databases: Internet Resources That Are More Than Links to Other Sites.

by
Michael Kreger
Animal Welfare Information Center, National Agricultural Library, Beltsville, Maryland 20705 USA

There are many web sites that briefly mention alternatives as part of the scope of laboratory animal care. Few, however, are devoted exclusively to the alternatives concept. In the United States, university animal care and use homepages often contain the institution's animal care protocol form with its alternatives narrative requirement, but those sites usually include links to outside sites for information on how to perform a database search and other information about alternatives. For the researcher, educator, or student in search of alternatives information, wandering from site to site for the best full-text information can be a challenge. The alphabetized list of web sites that follows emphasizes alternatives and the sites provide unique information developed by the host institution. This is certainly not an exhaustive guide as new sites become available and areas of emphasis may change. Table 1 compares the contents of original material found on the web sites listed. The list is current through April 12, 2000.

[Editor's Note: The U.S. Department of Agriculture does not promote any private web sites, and includes them here only for informational purposes.]

Alternatives to Skin Irritation Testing in Animals
Jane Huggins, Ph.D.
Toxicology Consulting Services
56-11 Hunter's Glen Dr.
Plainsboro, NJ 08536 USA
phone: (609) 716-0860, fax: (609) 716-8030
e-mail: webmaster@invitroderm.com
WWW: http://www.invitroderm.com

This not-for-profit web site has been developed to display information about alternatives to skin irritation testing in animals. The purpose of the site is primarily educational. It contains over 250 abstracts about this topic from peer-reviewed scientific journals. There is a Special Collections section with bibliographies about specific techniques such as EpiDerm, QSAR, and Isolated Perfused Porcine Skin Flap. The site also contains a thumbnailed photo gallery that illustrates the techniques discussed in the abstracts. There is also a section that answers typical questions from students. Nothing has been published here without the permission of the publisher or author.

Altweb
Johns Hopkins Center for Alternatives to Animal Testing (CAAT)
111 Market Place, Suite 840
Baltimore, MD 21202-6709 USA
phone: (410) 223-1612, fax: (410) 223-1603
e-mail: altweb@jhsph.edu
WWW: http://altweb.jhsph.edu

A very extensive site for news, information, discussion, and resources from the field of alternatives to animal testing. This site is a collaborative effort funded by the Alternatives Research & Development Foundation, the Doerenkamp-Zbinden Foundation, the Humane Society of the United States, the Office for Protection from Research Risks at the National Institutes of Health, and the Procter & Gamble Company. It is being developed by the Center for Alternatives to Animal Testing (CAAT) at Johns Hopkins University, in collaboration with the Altweb Project Team to serve academic, industrial and government scientists, educators, the media, and the general public. The team includes 14 national and international organizations including animal protection, animal research, Federal, academic, and nonprofit institutions.

One of the benefits of this site is the amount of full-text articles, conference proceedings, and current news and information. The General Information page contains information on the definition and history of alternatives, alternative fact sheets, a glossary, public meetings, related links, and a list of publications available in full-text from the site such as *The Principles of Humane Experimental Techniques*. "Science and Regulation" includes breaking news such as validation of a new alternative methods, regulations, grants and awards, an alternative procedure search, meetings calendar, other publications, and links to databases and web sites. "Educational Resources" is under construction, but contains a list of related educational links and will soon have software and computer resources, curriculum guides, and advice from educational specialists. Some of the publications on this site include conference proceedings and technical reports hosted by CAAT such as *TestSmart - A Humane and Efficient Approach to SIDS Data* and *Alternatives in Monoclonal Antibody Production*, *ALTEX* (Alternative to Animal Experiments) and other journal abstracts, and links to alternative methods reports such as those from ECVAM (European Council for the Validation of Alternative Methods).

Animal Welfare Information Center (AWIC)
National Agricultural Library
10301 Baltimore Avenue
Beltsville, MD 20705 USA
phone: (301) 504-6212, fax: (301) 504-7125
e-mail: awic@nal.usda.gov
WWW: http://www.nal.usda.gov/awic

AWIC was established in 1985 as part of an amendment to the Animal Welfare Act. This amendment, The Improved Standards for Laboratory Animals Act (Public Law 99-198) asks researchers who do biomedical research using animals to try to reduce pain and distress that animals experience in the laboratory. To help researchers determine if alternative methods are avail-

able, the amendment established AWIC as an information service at the National Agricultural Library. AWIC's mission is to provide training to researchers who use animals about more humane animal care and use and provide information for improving methods of animal experimentation that can reduce or replace animal use or minimize pain or distress to the animals.

The web site contains many AWIC-produced materials as well as links to related non-AWIC sites. Full-text issues of the *Animal Welfare Information Center Bulletin* contain articles on alternatives, information about grants, legislation, and new publications. Unlike the hardcopy version of the *Bulletin*, the web version contains links to authors, organizations mentioned in announcements, and important documents. The site also contains information and registration materials for the AWIC workshop *Meeting the Information Requirements of the Animal Welfare Act*, full-text publications such as over 60 bibliographies and resource guides ranging from *Anesthesia in Laboratory Animals* to *Information Resources for Environmental Enrichment in Laboratory Animals*, and articles on the alternatives requirement and searching written by AWIC staff. Some of the legislative documents relating to the Animal Welfare Act can be found only on this site. Links are provided to other Federal legislation and international regulations as well as to databases and organizations useful in searching for alternatives. The site contains a search engine.

AVAR Alternatives in Education Database
Nedim C. Buyukmihci, VMD
The Association of Veterinarians for Animal Rights
PO Box 208
Davis, CA 95617-0208 USA
phone: (916) 752-6037
e-mail: ncbuyukmihci@ucdavis.edu
WWW: http://www.avar.org

AVAR (the Association of Veterinarians for Animal Rights) maintains a database of audiovisual and text materials, computer programs, simulators, models, and other alternatives to the use of animals in education. Topics range from alternatives to high school dissection to training in microvascular surgery. Descriptions, ordering information, and images of the products are included. The database is not searchable on the Web, but is a free downloadable software program.

Center for Alternatives to Animal Testing (CAAT)
Johns Hopkins Center for Alternatives to Animal Testing (CAAT)
111 Market Place, Suite 840
Baltimore, MD 21202-6709, USA
phone: (410) 223-1693, fax: (410) 223-1603
e-mail: caat@jhsph.edu
WWW: http://www.jhsph.edu/~caat/caat.html

CAAT was founded in 1981 as an alternatives resource and granting organization. It has created and maintained the Altweb site. It awards grants to scientists interested in developing alternatives and has organized conferences and symposia about specific alternatives issues. The Extramural Grants Program awards pilot grants to scientists interested in developing alternatives to whole animals for product safety and drug efficacy testing. The In Vitro Toxicology Program is to facilitate collaboration among Johns Hopkins faculty interested in using in vitro systems in toxicity testing. Validation Program grants are for defining and validating in vitro test methods with the goal of achieving regulatory acceptance and implementation. The Information/Education Program is CAAT's major outreach program to provide balanced and scientifically accurate information on the status and use of alternatives in research, teaching, and testing. This is done by hosting symposia and publishing proceedings. The *CAAT Newsletter*, and a newsletter for middle school students called *CAATALYST* are out of print, but archival copies can be found on the site. The *CAAT Newsletter* is available online at Altweb and contains information on the 3Rs and alternative methods, information resources, grants programs, and international news items. *CAAT Technical Reports* such as *The International Status of Validation of In Vitro Toxicity Tests* from 1993 are on the CAAT and Altweb sites.

Compilation of Literature on the Assessment of Animal Welfare and Animal Distress
WWW: http://www.vetinfo.demon.nl/aw/index.html

A free bibliographic database compiled by Hans Kuiper of Utrecht University and T. Allen of the Animal Welfare Information Center. The site contains over 600 citations, some with links to the full text article, links to relevant organizations, legislation, and journals. The focus of this database is refinement alternatives.

ECVAM : The European Centre for the Validation of Alternative Methods
Institute for Health and Consumer Protection
EC-Joint Research Centre
21020 (VA) Ispra Italy
phone: +39 0332 785996, fax: +39 0332 785336

ECVAM, established by a Communication of the European Commission to Council and Parliament, was founded in 1993 and is part of the newly-formed Institute for Health and Consumer Protection of the Joint Research Centre of the European Commission since 1998. It was created to play a leading role at the European level in the independent evaluation of the relevance and reliability of tests and test strategies for specific purposes, through research on advanced methods and new test development and validation. Its primary purpose is to act as a focal point at the European level in this area, in relation to Directive 86/609/EEC, and seeks to promote the scientific and regulatory acceptance of alternative methods, aiming to replace, reduce, and refine use of laboratory animals. One area of ECVAM research is establishing the reliability and relevance of a procedure for a particular purpose in the various areas of alternatives that involves testing coded materials according to an identical protocol in several independent laboratories. Before validation of an alternative method, new tests must satisfy certain development criteria.

ECVAM's Scientific Information Service (SIS) is a database containing factual and evaluated information about nonanimal toxicity testing. It provides information on alternatives at any stage of development coming from a wide range of information sources. All ECVAM workshop reports are included in the SIS databases. Thirty-five have been published in the scientific journal *ATLA* and are already available on the FRAME and ALTWEB sites. Publication of a first part of SIS is expected for 2000.

Fund for the Replacement of Animals in Medical Experiments (FRAME)
Russell & Burch House
96-98 North Sherwood Street
Nottingham NG1 4EE United Kingdom
phone: +44 (0)115 958 4740, fax: +44 (0)115 950 3570
e-mail: frame@frame-uk.demon.co.uk
WWW: http://www.frame-uk.demon.co.uk/

Founded in 1969, FRAME is a charitable trust that advocates the 3 Rs of Russell and Burch by encouraging realistic consideration of ethical and scientific issues. FRAME publishes a scientific journal, *ATLA* (*Alternatives to Laboratory Animals*) that contains original scientific papers, reports of ECVAM (European Centre for the Validation of Alternative Methods), and workshops. FRAME also publishes a newsletter, *FRAME News*, aimed at scientists, politicians, administrators and the public, and *Friends of FRAME* which is published for FRAME individual supporters. The booklet *Selection and Use of Replacement Methods in Animal Experimentation,* produced by FRAME and UFAW, gives a brief overview of alternatives to use of animals and lists resources for further information. FRAME provides workshops on The Information Requirements of the Animals (Scientific Procedures) Act, to assist U.K. researchers in performing literature searches for alternatives. Fees vary according to materials.

The FRAME web site provides an original section on searching for alternatives. *A Guide to Searching for Alternatives to the Use of Laboratory Animals* by Krys Bottrill contains sections on search basics, search terms and strategies, Internet search engines, database selection and access, and mailing lists and other discussion forums. The sections contain in-depth descriptions and links to relevant outside articles, databases, and other resources. Other unique features of the site include extensive descriptions of types of alternatives, a list of suppliers of in vitro produced monoclonal antibodies, and lists of FRAME-funded research projects.

Humane Society of the United States (HSUS)
Animal Research Issues
700 Professional Dr.
Gaithersburg, MD 20879 USA
phone: (301) 258-3042, fax: (301) 258-7760
e-mail: dkossow@hsus.org
WWW: http://www.hsus.org

The mission of the HSUS Animal Research Issues division is to reduce and eventually eliminate harm to animals used in research, teaching, and testing through promotion of alternative methods and other means. This site includes position statements on alternatives, news analysis, the HSUS campaign to eliminate pain and distress, and a section on animals in education. The division operates a loan program to provide students and educators with alternatives to classroom animal dissection and live animal experimentation. The only cost to borrowers is return postage. Borrowers can be international as well as domestic. The materials are at secondary school and college levels and include models, software, CD-ROMs, charts, and videotapes. A description of the program and each product is on the web site.

Interagency Coordinating Committee for the Validation of Alternative Methods (ICCVAM)
NICEATM, NIEHS, ICCVAM
79 Alexander Drive, Mail Drop EC-17
Research Triangle Park, NC 27709 USA
phone: (919) 541-3398, fax: (919) 541-0947
e-mail: NICEATM@niehs.nih.gov
WWW: http://iccvam.niehs.nih.gov

ICCVAM and its supporting center, NICEATM (the National Toxicology Program Interagency Center for the Evaluation of Alternative Toxicological Methods), coordinate development, validation, acceptance, and harmonization of alternative toxicological test methods throughout the U.S. Federal Government. ICCVAM and NICEATM focus efforts on alternatives that predict human and ecological effects better than currently used methods and improve toxicity characterization, increase savings in time and cost, and implement the 3 Rs. The web site includes the full text of current ICCVAM reports such as the Corrositex Report, meeting proceedings, information about testing method development, and methods under review.

The Norwegian Reference Centre for Laboratory Animal Science & Alternatives
Knutepunktet for forsøksdyrlære og alternativer til dyreforsøk
Laboratory Animal Unit
Norwegian School of Veterinary Science
P.O. Box 8146 Dep.,
N-0033 Oslo Norway
phone: +47 22 96 45 74 or +47 22 96 45 75
fax: +47 22 96 45 35, e-mail: adrian.smith@veths.no
WWW: http://oslovet.veths.no

The Reference Centre supports the Laboratory Animal Unit of the Norwegian School of Veterinary Science and the general public by providing information on teaching and training in laboratory animal science, alternatives to animal experiments, health monitoring of laboratory animals, and animal welfare and ethics. The site contains full-text articles about laboratory animal science, Norwegian legislation, meeting announcements, links, the **NORINA** database, and **Information on Alternatives Databases.**

NORINA (A Norwegian Inventory of Alternatives)
WWW: http://oslovet.veths.no/NORINA

The NORINA database provides an overview of possible alternatives or supplements to the use of animals in education from primary schools through university levels. It consists of about 3600 entries, (May 1999) including computer programs, CD-ROMs, interactive videos, films and more traditional teaching aids such as slide series, 3-D models, and classroom charts. There is also a section for Contact Persons who are developing and/or using audiovisuals at their institution and for suppliers of audiovisuals. The database is keyword searchable and search results include descriptions and ordering information for the products. Users, developers, and suppliers of audiovisuals are invited to send in details for future updates of the database.

Information on Alternatives Databases
WWW: http://oslovet.veths.no/databasesintro.html

This collection of links to over 20 databases resulted from an international collaboration following the ECVAM Workshop on Alternatives Databases (1996) and the 2nd World Congress on Alternatives and Animal Use in the Life Sciences. The databases are briefly described and numerically coded by areas covered (for example, databases of experts, funding, reduction alternatives).

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School of Veterinary Medicine
University of California
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phone: (530) 752-1800
e-mail: animalalternatives@ucdavis.edu
WWW: http://www.vetmed.ucdavis.edu/Animal_Alternatives/main.htm

The Center disseminates information concerning models, computer programs, and other animal alternatives in education through every level of public and private education. It coordinates the sharing of alternative products and information for the University of California (UC) system, maintains a library for UC employees, and provides outreach and educational activities related to alternatives.

The web site includes original publications such as bibliographies and resource guides, the newsletter *UC Alert*, and proceedings summaries from workshops hosted by a UC institution such as The Third R: Refinement Workshop. The site also includes original information about how to perform the alternative literature search (including the service provided by the UC Center, terminology, and list of bibliographic databases) and automated search templates for refinement of research methods with mice and unobtrusive study of animals in the wild.

Summary There are many web sites that contain information about alternatives. The future might bring consolidation of materials from diverse sites into one major source such as Altweb or more specialized sites for particular alternatives such as Skin Irritation Testing. While some sites cover alternatives in education, research, and testing, they may have specialty areas. From the list below, here are some examples:

Education: AVAR, HSUS, NORINA, UCCAA
Research: Altweb, AWIC, FRAME
Testing: ICCVAM, Skin Irritation Testing

I hope that this list will provide the research and animal protection communities as well as the general public with a starting point for identifying and understanding the world of alternatives.

Table 1: Comparison of Alternative Web Sites[1]

	Altweb	AVAR	AWIC	CAAT	FRAME	HSUS	ICCVAM	Nor. Ref. Centre	NORINA	Skin Irritation	UCCAA
Articles[2]	✔		✔	✔	✔	✔	✔	✔			✔
Abstracts	✔	✔	✔		✔				✔	✔	
Bibliographies[2]			✔			✔				✔	✔
Conf. Proceed.[2]	✔		✔	✔	✔		✔				✔
Dbase links	✔		✔		✔	✔		✔			✔
Document Links	✔		✔	✔	✔	✔		✔	✔		✔
Grant Info.	✔		✔	✔							
Grant Pgm.				✔							
How to Search[2]			✔		✔						✔
Legislation	✔		✔	✔	✔		✔	✔			
List of Altern. Methods	✔	✔	✔		✔	✔	✔		✔	✔	✔
Organiz. Links	✔		✔		✔	✔	✔	✔	✔		✔
Search Engine	✔		✔			✔		✔	✔	✔	✔

[1]Web sites are very dynamic. New features become available, and contents are updated. The checked categories identify areas of emphasis as of January 2000. This chart is intended to highlight the areas of emphasis of each site and not to provide an overall ranking. Please note that *Bibliographies* used here refers to documents that are posted as bibliographies and are not reference sections from articles, workshops, or conference proceedings.

[2]Original material produced by the site's host institution or from another institution but found only on that site. If the site links to information from other institutions, it is listed under *Document Links* ■

EPA, OSHA and CPSC Accept Non-Animal System for Screening Chemicals - Skin Corrosiveness

National Institute of Environmental Health Sciences Press Release
March 21, 2000

Major federal regulatory agencies - the Environmental Protection Agency, the Occupational Safety and Health Administration, and the Consumer Product Safety Commission- have agreed to accept chemical safety data from a synthetic skin test in lieu of an animal test, the National Toxicology Program announced today.

This is the first such general substitution of a non-animal test under a new federal program to reduce animal experimentation.

The regulatory agencies are preparing Federal Register notices to tell industry and other research institutions they can use the non-animal test for regulatory purposes. The regulatory actions were announced today by the National Toxicology Program, which is headquartered at the National Institute of Environmental Health Sciences in Research Triangle Park, N.C. NIEHS and other federal agencies support the Interagency Coordinating Committee on the Validation of Alternative Methods, an organization established in 1997 to foster alternative and improved test methods. The Food and Drug Administration also endorsed the acceptability of the method, but said that corrosivity testing for the types of products it regulates is likely to be limited. Also, on a limited basis, the Department of Transportation has already been accepting the method for certain chemicals.

The new test can replace, in many uses, a method in which a chemical or chemical mixture was placed on the intact skin of a laboratory rabbit. Several thousand rabbits have been used each year in the old test, according to one estimate.

Under ICCVAM's sponsorship, a scientific panel performed a scientific review of the test and recommended it last year to the regulatory agencies. The panel said the new method could fully replace the use of animals for testing corrosiveness in some cases, while in others, when the chemical "passed" the screen as probably safe, an animal test would be required to confirm that the chemical is not corrosive. In addition, some chemicals cannot be evaluated in the assay, and these must be tested using the standard animal test, which requires one to three rabbits.

William Stokes, D.V.M., the National Institute of Environmental Health Sciences' associate director for animal and alternative resources, said, "The old test requirements called for three animals for each chemical that is evaluated for skin corrosivity and dermal irritation. Since there are more than two thousand chemicals introduced each year, the substitution of Corrositex could save many laboratory animals in a year."

Skin corrosiveness testing is conducted to ensure that chemicals and products are properly labeled to alert consumers and workers to take precautions to prevent chemical burns to the skin. Corrosion is more serious than skin irritation and involves permanent damage to skin, usually with scarring.

In the new test, developed under the trade name Corrositex, a chemical or chemical mixture is placed on a collagen matrix barrier that serves as a kind of synthetic skin. Once it penetrates the barrier, the chemical causes a color change in a liquid detection system composed of indicator dyes that are sensitive to strong acids and bases at pH extremes. The time it takes for a test chemical to penetrate the barrier and produce a color change in the detection system is compared to a classification chart to determine corrosivity.

In order to develop a scientific consensus on the usefulness and limitations of the new test, panel members evaluated all available information and data to determine the extent to which the ICCVAM criteria for validation and acceptance of new test methods was addressed.

This is the second substitute test to be approved by federal regulatory agencies after an ICCVAM panel review. The first review resulted in the acceptance by regulatory agencies of a test called the Murine Local Lymph Node Assay that uses fewer animals to determine the potential of chemicals to cause allergic dermatitis. The new, less painful assay also uses mice instead of guinea pigs.

Corrositex is sold as a test kit by InVitro International of Irvine, Calif.

Representing the regulatory agencies on the ICCVAM are these scientists:

Dr. Surender Ahir, OSHA, 202/693-2092
Dr. Marilyn Wind, CPSC, 301/504-0477, ext. 1205
Dr. Richard Hill, EPA, 202/260-2894
Dr. Leonard M. Schechtman, FDA, 301/827-5186. ■

Office of Extramural Research (OER) Guidance Regarding Reduction of Regulatory Burden in Laboratory Animal Welfare

Release Date: December 21, 1999
NOTICE: OD-00-007
National Institutes of Health

This notice provides guidance to Public Health Service (PHS) awardee institutions and Institutional Animal Care and Use Committees (IACUCs) on existing ways to reduce the burden of provisions of the PHS Policy on Humane Care and Use of Laboratory Animals (PHS Policy).

Background

In its report on the FY 1998 budget, the House Committee on Appropriations requested that NIH undertake an effort to streamline Federal regulations that govern the conduct of extramural scientific research while continuing to provide the intended protections. The initial focus comprised five areas, one of which was animal care and use. The report–*A NIH Initiative to Reduce Regulatory Burden - Identification of Issues and Potential Solutions*–available on the OER WWW site at: http://grants.nih.gov/grants/policy/regulatoryburden/index.htm was completed in March, 1999. After public comment on the report, NIH developed a Regulatory Burden Three-month Plan, available on the OER www site at:

http://grants.nih.gov/grants/policy/regulatoryburden/regburd3monthplan_09_1999.htm .

The NIH plan identified several activities that could be readily pursued without the need for additional legislation or rulemaking. Two of the activities called for the Division of Animal Welfare, Office for Protection from Research Risks (OPRR), OER, to issue guidance to institutions concerning currently available options to reduce regulatory burden. The guidance is as follows:

Synchronization Of Reporting Periods

The PHS Policy requires that institutions notify OPRR at least once every 12 months of any change in the institution's program, any changes in the IACUC membership, and the dates that the IACUC conducted its semiannual evaluations of the program and facilities. Institutions that are covered by the USDA animal welfare regulations are required to submit APHIS Form 7023, Annual Report of Research Facility, by December 1 of every year, providing assurances concerning professional standards governing care and consideration of alternatives, and data regarding animals used in research. Institutions that are accredited by the Association for the Assessment and Accreditation of Laboratory Animal Care International (AAALAC) must submit an annual report to AAALAC providing a program and facility update. Significant burden reduction could result from gathering similar reporting data over the same time period. In fact, beginning in 1998 AAALAC modified its annual reporting requirements to allow accredited programs to employ the USDA-specified reporting period and animal use data.

The PHS Policy reporting requirement does not specify the time of year that an institution must report. In most cases, by default, institutions report to OPRR on the anniversary of the approval of the institution's Animal Welfare Assurance.

If institutions wish to change the date that they report to OPRR in order to synchronize the date with other annual reporting requirements, institutions may submit a report at any time before the end of any given 12 month cycle, essentially resetting the clock with regard to their annual reporting requirement under the PHS Policy. Subsequent reports would be due 12 months later.

Utilization Of AAALAC Activities As Semiannual Program Evaluation

The PHS Policy requires IACUCs to review at least once every six months the institution's program for humane care and use of animals, and inspect at least once every six months all of the institution's animal facilities. The IACUC is also responsible for preparing reports of the IACUC evaluations and submitting the reports to the Institutional Official (PHS Policy IV.B.1.-3.). The Guide for the Care and Use of Laboratory Animals (Guide) is to be used by the IACUC as a basis for evaluating the program and facilities.

The PHS Policy further provides that the IACUC may, at its discretion, determine the best means of conducting an evaluation of the institution's programs and facilities. The IACUC may invite ad hoc consultants to assist in conducing the evaluation. However, the IACUC remains responsible for the evaluation and report. (PHS Policy, footnote 7.)

The provision to utilize ad hoc consultants may be invoked by IACUCs to make use of either of the two AAALAC assessment programs (Program Status Evaluation or Accreditation), or the pre-assessment preparation activities, to meet the requirements for an IACUC semiannual program evaluation and subsequent report.

To utilize one of these AAALAC- related activities as a semiannual evaluation, the IACUC must ensure that the following provisions of the PHS Policy and USDA animal welfare regulations, as applicable, are met:

- the IACUC report of the program review must comply with section IV.B.3. of the PHS Policy which requires that the report contain certain information regarding the institution's

adherence to the Guide, including a plan and schedule for correcting each deficiency identified in the report.

- the report must be endorsed by the IACUC as an official IACUC report, and submitted by the IACUC to the Institutional Official.

For institutions covered by USDA animal welfare regulations:

- the report must comply with §2.31(c) of USDA regulations;
- at least two IACUC members must participate in the evaluation;
- no IACUC member wishing to participate in any evaluation may be excluded;
- the report must be signed by a majority of the IACUC members; and
- the report must include any minority reviews.

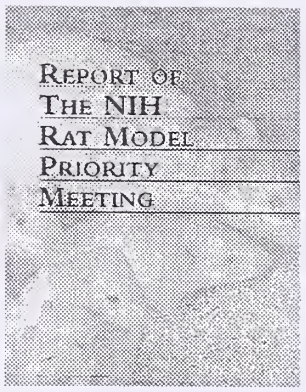
The Animal Care unit of the USDA Animal and Plant Health Inspection Service and AAALAC have reviewed and concur with the guidance provided in this notice.

For questions or further information, contact:

Office of the Director
Office of Extramural Research
Office for Protection from Research Risks
Division of Animal Welfare
6100 Executive Blvd., Suite 3B01
Rockville, Maryland 20892-7507
telephone: (301) 496-7163
fax: (301) 402-2803
e-mail: carol_wigglesworth@nih.gov

Name Change for NIH, OPRR, Division of Animal Welfare

The Office for Protection from Research Risks' Division of Animal Welfare has been renamed the Office of Laboratory Animal Welfare (OLAW) effective March 2, 2000. The Director, Dr. Nelson Garnett, will report to the NIH Deputy Director for Extramural Research, Dr. Wendy Baldwin. OLAW will be responsible for all of the animal-related functions of the OPRR Their new web address is http://grants.nih.gov/grants/olaw/olaw.htm



NIH Meeting on Rat Model Priorities

The purpose of the NIH Rat Model Priority Meeting, held May 3, 1999, on the campus of NIH, was to discuss, the opportunities that rat models offer and the investments that are needed to capitalize on these opportunities. The major issues addressed at the meeting were: where does rat model fit in the broader scientific picture, what unique value does the rat model provide, what are the key areas of opportunity for investment, and what will be the impact of these proposed investments.

Participants were charged by Dr. Harold Varmus, [former] Director of NIH, to prepare a report that contains a summary of the major themes and recommendations, a sense of priorities, and a practical look at costs. The report from this meeting is available at

http://www.nhlbi.nih.gov/resources/docs/ratmtgpg.htm

NATIONAL ANIMAL WELFARE EDUCATION WORKSHOP PROGRAM

The National Institutes of Health, Office of Laboratory Animal Welfare (OLAW) is continuing to sponsor workshops on implementing the Public Health Service Policy on Animal Welfare Education. Each of the workshops will focus on a specific theme.

The workshops are open to institutional administrators, members of Institutional Animal Care and Use Committees, laboratory animal veterinarians, investigators and other institutional staff who have responsibility for high-quality management of sound institutional animal care and use programs. Ample opportunities will be provided to exchange ideas and interests through question and answer sessions and informal discussions.

For further information concerning future NIH Office of Laboratory Animal Welfare Education Workshops, please contact: Agnes Richardson, Office of Laboratory Animal Welfare (OLAW), RKL1, Suite 1050, MSC 7982, 6705 Rockledge Drive, Bethesda, MD 20892-7982 phone: 301-594-2506, Fax: 301-402-2803, WWW: http://grants.nih.gov/grants/olaw/workshop.htm

NOTE: for Express or Hand Delivered Mail, Use Zip Code 20817

The next workshop will be held September 21-22, 2000, in Charleston, South Carolina and is being sponsored by the Medical University of South Carolina and Benedict College (Columbia).

The topic will be "IACUC Issues in Field Biology."

USDA News

Federal Agencies Move Forward On Bison And Cattle Protection Plan

The federal agencies involved in the Yellowstone bison situation have advised the state of Montana that they are moving ahead to complete an Environmental Impact Statement (EIS) on the management of the Yellowstone National Park bison herd.

Because the negotiations with Montana have reached an impasse, agency officials have decided to move forward on their own to complete the EIS and take other steps to protect cattle and minimize the lethal control of bison.

"We all agree that protecting Montana cattle is critical," said Michael Dunn, Undersecretary of Agriculture for marketing and regulatory programs, "but we believe significant adjustments can be made to the current bison test and slaughter policy."

"We have spent countless hours combining the best science, experience and practicality to protect both cattle and bison," said Don Barry, Assistant Secretary of the Interior for Fish, Wildlife and Parks. "Unfortunately, we have reached an impasse with the state and we feel we must move forward on our own."

The agency proposal is designed to address both short-term and long-term goals of the EIS process, including the eventual eradication of brucellosis from the Yellowstone ecosystem. In the short term, it would provide spatial and temporal separation of bison and cattle through a zoned approach. The proposal would allow bison outside of the Park only in three very limited and well-defined areas west and north of the Park. Only 100 would be allowed in the Horse Butte west boundary area, only 100 in the Reese Creek area, and only 200 in the Eagle Creek/Bear Creek area. Adjustments would be made as more is learned through daily operations.

These zones would then be buffered by additional zones into which no bison would be permitted. Cattle would be permitted back in the zones 45 days after bison have returned to the Park. Given that the brucella organism survives for only approximately 17 days in spring conditions, this 45 day separation allows more than ample time for the organism to expire.

Long-term, the agencies are committed to developing and using a safe and effective vaccine in the Park until brucellosis is eradicated from the herd and would include such efforts in the proposal. Safety studies for calfhood vaccination should be completed by the winter of 2000-2001. Studies on vaccine effectiveness should be completed by the fall of 2002 and a safe and effective delivery mechanism should be developed b the summer of 2002.

The Park Service, the Forest Service, and APHIS are in agreement on the basic elements of a sound, workable plan. The Park Service has agreed to vaccinate inside the Park. The Forest Service has adjusted grazing allotments to help maintain critical separation between bison and cattle. APHIS has clearly stated that the federal plan will not jeopardize Montana's brucellosis-free status. Further, the recent $13 million purchase of lands north of the Park has provided significant additional potential for bison winter grazing.

As the agencies move forward, they will continue working with Montana on daily bison management issues.

BEAGLES AVAILABLE FOR ADOPTION FROM USDA NATIONAL DETECTOR DOG TRAINING CENTER

The U.S. Department of Agriculture has beagles available for adoption from its National Detector Dog Training Center in Orlando, Fla.

"This is one of the greatest aspects of this program," said Michael V. Dunn, under secretary for marketing and regulatory programs. "These dogs are matched with USDA officers to form teams to assist us with our mission of safeguarding U.S. agriculture. When these dogs retire from service, or if they don't make it through evaluations and training, we make it part of our job to ensure they get placed into good homes."

The Center is the Animal and Plant Health Inspection Service's training facility for USDA's Beagle Brigade. The Beagle Brigade recruits canines through humane societies, beagle rescue groups, and private owners to work at 21 international airports, three land border ports and select U.S. mail facilities. The beagles are used to detect prohibited agricultural items such as fruits, plants, and meats. These items can carry plant and animal pests and diseases that could endanger U.S. agriculture.

"According to the Department of Commerce, international travel to the United States is projected to increase by 12 percent over the next four years, from 46 million people to 52 million," said Dunn. "Many times, travelers are unaware that what they are carrying could start a Mediterranean fruit fly outbreak or an outbreak of classical swine fever. The beagles not only assist us in detecting the products that someone may have, they also give us an opportunity to conduct our job in a nonthreatening manner and educate the public at the same time."

The Beagle Brigade is just one way USDA works to safeguard the $208 billion U.S. agriculture and natural resources economy. The 1,300 or so APHIS inspectors and about 50 beagles stationed at more than 90 ports of entry make up the first line of protection for the nation's largest industry, agriculture. Through the inspection process, APHIS inspectors help safeguard our agriculture, the 2.1 million farms in the United States, and the food budget and nutritional choices of every American consumer.

If you'd like more information on adopting a beagle from the National Detector Dog Training Center, please contact the Center at (407) 816-1192.

United States Department of Agriculture Position Statement

Large Wild and Exotic Cats Make Dangerous Pets

Animal and Plant Health Inspection Service
Miscellaneous Publication No. 1560
Issued February 2000

Large wild and exotic cats such as lions, tigers, cougars, and leopards are dangerous animals. The U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) believes that only qualified, trained professionals should keep these animals, even if they are only to be pets. Care and handling of these wild and exotic cats should be left to trained professionals who have the knowledge and means to maintain them properly.

APHIS' Animal Care (AC) program is responsible for enforcing the Animal Welfare Act, which includes regulating and inspecting exhibitors of wild and exotic animals. AC personnel have seen too many instances where wild and exotic cats kept by untrained people have not only harmed people but suffered themselves due to poor care.

Although USDA does not regulate the ownership and care of large wild and exotic cats as pets, State and local laws may apply in some situations.

Human Safety

In most instances, the average person does not have the knowledge or experience to handle such an animal safely at home or in public. Some owners take their animals into inappropriate public places and situations, such as schools, parks, and shopping malls. Because of these animals' potential to kill or severely injure both people and other animals, an untrained person should not keep them as pets. Doing so poses serious risks to family, friends, neighbors, and the general public. Even an animal that is friendly and loving can be very dangerous. In AC's experience, unsuspecting children and adults have been seriously injured or killed, even when the animals involved were "only playing."

The Animal's Well-Being

The average person lacks the specialized equipment and expertise to provide properly for the containment, medical care, husbandry, and nutrition of a large wild or exotic cat. AC has seen this lack of expertise result in the unnecessary suffering and premature death of animals. Some owners request otherwise unnecessary surgical procedures in an effort to make their animals more suitable as pets, although even declawed and defanged animals are still highly dangerous. Owners may find it difficult to obtain appropriate veterinary care for the animal because few veterinarians are qualified and willing to care for large wild and exotic animals that are individually owned.

Large wild and exotic cats obtained as pets are usually acquired as appealing cubs, but when the animals are fully grown, owners often become dismayed at the high cost and difficulty of providing for their upkeep. As a result of these difficulties, or because the animal has either attacked someone or otherwise shown aggression, the owners may try to find a new home for their animal. Placement of these unwanted animals is difficult because most zoos are unwilling to take them and few sanctuary facilities exist. Many of these cats end up being killed for their pelts and meat.

Additional Information

You can find more information on APHIS and AC on the Internet at www.aphis.usda.gov/ac or by writing to

USDA, APHIS, AC
4700 River Road, Unit 84
Riverdale, MD 20737-1234
e-mail: ace@usda.gov

Triple A cont'd from p.2

not to euthanize an animal unless all attempts to reach the investigator had been made and, in the opinion of the veterinarian, the animal was approaching death. We also agreed to save tissues from animals we euthanized. Last but not least, we agreed to a list of drugs that could be used that would not interfere with the study and all intervention therapies were approved in advance, as were criteria for euthanasia. The investigators, on the other hand, agreed to write the date of injection of sensitized lymphocytes on the cage card plus the animal's weight (considered baseline weight). They also notified us as to when they expected clinical signs to begin. It was anticipated that the information obtained would provide guides for the feasibility of assessing discomfort in EAE animal models. Discomfort was assessed quantitatively by veterinary technicians and three veterinarians who were familiar with the experimental animals. Female mice (SJL/J) were used as this strain is recognized as being susceptible to induction of EAE. The facility is maintained as a specific-pathogen free facility and cages are maintained in environmentally controlled rooms, at $72^{o} \pm 2^{o}$ F and 40-50 percent humidity, on a 12:12 hour light:dark cycle, with lights on at 6 AM (0600). All mice were fed a standard laboratory diet (NIH-07 Rat and Mouse Chow, Ziegler Bros., Gardners, Pennsylvania) and provided water ad libitum. Mice were kept in polycarbonate cages with a layer of bedding (Tek-Fresh, Harlan TEKLAD, Madison, Wisconsin) and filter tops in a ventilated rack (Maxi-Miser Caging System, Thoren, Hazelton, Pennsylvania). At the time of injection with myelin basic protein (MBP), the mice were weighed.

As the veterinary technical staff began to use the assessment chart, we began to recognize subtle impairment in motor skills. This was a direct result of pulling each cage of mice to closely observe them as we approached the time that the investigator had estimated clinical signs might begin. As we developed our observational skills, we began categorizing mice in EAE grade 1 earlier and earlier, which resulted in more intense monitoring. As we gained both experience with the animal model and investigator confidence, we began modifying the assessment chart to reflect more intense nursing during acute and relapse phases of the disease. The assessment charts became increasingly more complex (tables 3 and 4). The results of this were:

- Animals lived longer allowing investigators to reach study endpoints.
- There were anecdotal stories that the investigators did not believe their animal data because animals lived longer and maintained fairly stable weights (except during acute phases of the disease).
- Our experience with the mouse model helped us formulate similar assessment charts for EAE studies with marmosets and pigs.
- The investigators now ask for our observational data (weight) to correlate with their measurement of disease.

Through persistence, a partnership forged collaborative recognition and reduced the number of animals used for each experiment.

Our experience, over the past several years, in refining these interventional charts is worth noting. First of all, we learned that before we began to pull individual cages, it was best to look at the cages from a distance. By this, I mean we learned to scan cages on a rack, looking for differences in animal activity from cage to cage. We were able to quickly identify new cages of animals showing clinical signs by decreased activity or inability to see the animals (partially buried in bedding or remaining at the back of the cage). We also learned to begin handling the animals as soon as they arrived to acclimate them to the increased handling and observation that was sure to follow once an experimental group was formed. This point cannot be overemphasized—acclimating animals to handling/observation minimizes measurable differences in biological responses that may adversely affect the experiment (stress). This also allows the staff to experiment with food enrichment which, during later illness, may be invaluable in providing

Table 3. Clinical assessment of EAE: All mice will be evaluated daily for signs of disease and graded on a scale of 0 to 5 according to the severity of the symptoms.

EAE GRADE	CLINICAL SIGNS	INTERVENTION ACTION
0	No abnormality	Baseline weight (average/cage)
1	Initial signs but no paraparesis: Clumsiness, incontinence or atonic bladder, flaccid tail.	If atonic bladder present, express daily and check hydration status. At this time, fruit, cereal, and other nutrients will be added to the cage bottom, at the discretion of the veterinarian. If an animal appears dehydrated, fluids will be given. Initiate a medical record.
2	Mild paraparesis. Trouble initiating movement but walk well once started.	Same as above. Begin weighing animals three times per week.
3	Moderate paraparesis: inability to move one or both hindlegs, noticeable gait disturbance, possible atonic bladder.	Food and water more accessible (feed pellets and fruit as fluid supplementation placed on floor of cage). Express urinary bladder daily. Weigh three times per week. Euthanize if ≥ 20 percent body weight loss.
4	Moderate quadriparesis/quadriparalysis	Euthanize, except when investigators develop and implement a plan for at least twice daily gavage and subcutaneous fluid administration, with a medical record kept on each individual animal. Express urinary bladder daily.
5	Moribund	Euthanize within the day.

Table 4. Clinical Assessment of EAE: All mice will be evaluated daily for signs of disease and graded on a scale of 0 to 5 according to the severity of the symptoms.

EAE GRADE	CLINICAL SIGNS	INTERVENTION ACTION
0	No abnormality	Baseline weight (average/cage)
1	Initial signs but no paraparesis: clumsiness, incontinence or atonic bladder; flaccid tail.	If atonic bladder present, express daily and check hydration status twice daily. At this time fruit, cereal, and other nutrients will be added to the cage bottom. If an animal appears dehydrated, fluids will be given, as needed, either IP or SQ. Identify individual animals by a mark on the tail with black ink. Initiate a medical record. Initiate an EAE chart and record weight(s).
2	Mild paraparesis: Trouble initiating movement but walk well once started, possible atonic bladder.	Same as above; if five mice in a cage and only one affected, consider separating to allow better access to feed. Per veterinary assessment, mice may be fed a high protein liquid diet supplement. Begin weighing animals three times a week, recording their weights on the medical record and the EAE chart.
3	Moderate paraparesis: inability to move one or both hindlegs, noticeable gait disturbance, possible atonic bladders.	Food and water more accessible (for example, feed mash placed on floor of cage, water bottle w/long sipper tube, and fruit as fluid supplementation). Express urinary bladder twice daily; give fluids, if necessary. Animals may need supplemental heat (see no. 4, below). Weigh at least three times per week. Euthanize if ≥ 20 percent body weight loss.
4	Moderate quadriparesis/ quadriparalysis.	Euthanize, except when investigators develop and implement a plan for at least twice daily gavage, and subcutaneous fluid administration, with a medical record kept on each individual animal. Weigh the animal daily (and record). Express urinary bladder, if needed; wash and dry animal in case of urine staining (incontinent). Animal(s) will also be provided an external means of heat, if needed (heat lamp, Safe 'n Warm, nestlets with additional bedding, etc.).
5	Moribund	Euthanize within the day.

needed caloric intake. Second, we pulled cages and observed animal activity and appearance. Subtle changes in overall appearance of a group of animals may be the first indication of abnormality. We concentrated primarily on motor function, such as how the animal rested: hunched up (abdominal pain) or legs in abnormal positions (straight out behind them = paresis; wide front leg stance = chest pain or difficulty breathing) or on animals that seemed hesitant to move (gait disturbance), animals isolated from the group, etc. These mice were individually assessed.

If you pick a mouse up by the base of its tail, a normal mouse will display a typical plantar reaction (figure 1a) whereas mice with early signs of neurological deficit exhibit a clasping behavior (figure 1b) that can be unilateral (less severe) or bilateral. Other signs of onset of clinical disease were bradykinesia and/or hypokinesia, that were usually unilateral and disappeared, initially, when the mice were stimulated to walk. Therefore, it was important to be particularly observant of the animals on initial opening of a cage or early signs of neurological deficit might be missed. When mice exhibited any mild deficit, they were weighed and classified as EAE grade 1. From that point forward, mice in this cage (and injection group) were observed more stringently and mice with neurological deficits were closely examined each day for progression of disease. Another assessment made was noting how well mice groomed themselves. As EAE progressed, we began to see urine scald and or evidence of fecal material around the anal orifice. This observation led to the need to clean these mice at least twice daily. Other phys-

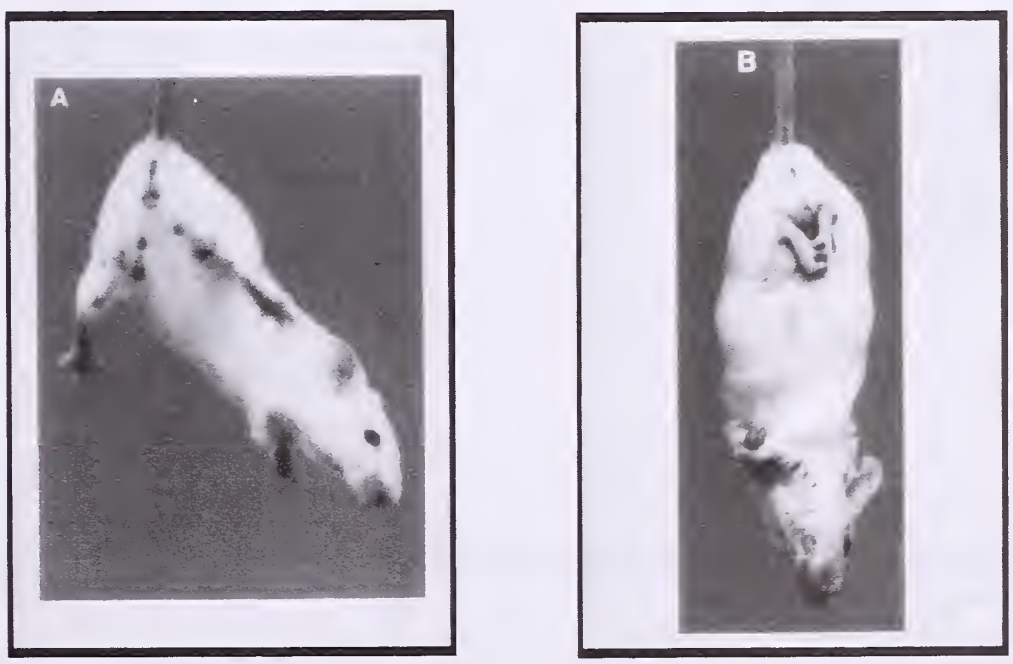


Figure 1. A) Plantar reaction from a normal mouse. B) This mouse will appear normal in the cage but when you pick it up, he exhibits "clasping" rather than the normal plantar reaction.

ical assessments made were palpation of the bladder—frequently the bladder became atonic, requiring urine expression 2-3 times daily—and assessment of dehydration by noting skin turgor, coat condition, recessed eyes and occasionally measuring packed cell volume and specific gravity of urine. As Beynen et al. (1987) reported, we found that this approach to health assessment of EAE animals led to earlier intervention points, more intense nursing care than originally envisioned, and modification of the EAE clinical charts. We also became more appreciative of the variability of response between animals within a treatment group and within a cage. It was the rule, not the exception, that at least one or more animals rarely progressed to EAE 3 during the acute stage of the disease — most were EAE 2; however, an occasional animal did qualify for EAE 4 designation, which required intense nursing. We agree with Flecknell (1994) that we cannot blanket treat animals. Significant refinement of procedures will occur only if individual animal assessment is conducted as standard procedure. We also weighed the mice with increasing frequency as clinical symptoms indicated reduced food intake. Other signs of reduced food intake, such as decreased urine/fecal production are more difficult to assess in a cage of animals, unless all animals are in the same clinical condition. However, we did use soiled bedding as an indicator during our initial scan of cages from a distance. When mice were designated EAE2/3 or EAE 3, we began assessing their cardiovascular system by noting cold extremities and pale ears. Heat supplementation was provided.

The above example is only one way in which we try to refine animal experiments; our goal is to refine as many procedures as possible. This may mean convincing investigators to switch from injectable anesthetics to inhalant anesthetics, which frequently have fewer side-effects on animal physiological responses. Similarly, attention to intraoperative monitoring of anesthesia can significantly refine a study by minimizing detrimental effects and reducing risk of over-anesthetizing animals which leads to their death. We also consider the method of anesthetic or analgesic delivery, realizing that their use is not without its own inherent stress to the animals—and thus, as stated earlier, there is an emphasis on conditioning animals to handling prior to experimentation. Other areas that we are working on are refinement of tumor studies, use of complete Freund's adjuvant, and ascites production of monoclonal antibodies. We recognize that there are many ways to achieve refinement if we learn to look beyond our own assumptions and conditioning as to what is "normal" in the way we interact with animals.

Acknowledgment

I would like to thank Dr. Victoria Hampshire for her creativity in finding solutions to provide excellent nursing care to these mice. She experimented with several gelatin recipes before finding one that the mice ate and provided the caloric content needed to maintain or increase their weight. She also created the "mouse pocket."

References

Beynen, A.C., V. Baumans, A.P.M.G. Bertens, R. Havenaar, et al. (1987). Assessment of discomfort in gallstone- bearing mice: a practical example of the problems encountered in an attempt to recognize discomfort in laboratory animals. Laboratory Animals 2l: 35-42.

Flecknell, P.A. (1994). Refinement of animal use—assessment and alleviation of pain and distress. Laboratory Animals 28: 222-231. ■

Strategies for Providing Interventional Nursing Care

← An isolated warmed holding area such as this unit made by Thermocare, Inc. (Incline Village, NV) works well for recovering several rodents at a time. Oxygen can also be fed through one of the many side ports. This unit costs between $945 and $1060.

↑ Alternatively, a hand-sewn triple-layer of Polar Fleece can hold a single-use pocket warmer in one pocket and a mouse in the other. It serves nicely to keep mice warm. The mouse, as it regains body temperature, can move out of the "pocket" as it wishes. Some mice prefer to lay on top of the fleece pocket whereas others "bury" it under bedding and then lie in the bedding. You need to replace the pocket at least daily; the fleece is washable. Handwarmers are purchased at any sporting goods store.

Recipe for high-calorie mouse gelatin:

2 cups boiling water
1 pgk raspberry-flavored gelatin
60 ml Stat VME
20 ml Pediasure
2 scoops of Designer Protein (GNC Health Food Stores)
Blend well and refrigerate in ice cube trays
Feed one-quarter cube per mouse per day

International News...

[New Zealand] Animal Welfare Act Heralds New Era

7 October 1999—The passing of the Animal Welfare Act is a significant achievement which represents a major philosophical shift from the former Animals Protection Act, Minister for Food and Fibre John Luxton said today.

"The old Act was nearly 40 years old and focused on punishing acts of cruelty. The new legislation adopts an animal welfare rather than animal rights philosophy."

The new Animal Welfare Act provides legislative power for codes of welfare to be developed. They will contain minimum standards and recommendations for the care of animals. The codes will be developed in a consultative manner allowing the community's views to be taken into account. In this way the standards developed will reflect the expectations the New Zealand public has for the welfare of animals.

The Act also provides a rigorous framework for managing the use of live animals in research. It gives legal standing for existing practices, improves accountability and promotes the concept of the "Three Rs": to reduce, refine and replace animals in research.

"New Zealand's approach shows a strong sense of ethical commitment and contrasts with the more heavy-handed Government intervention that occurs in some other countries," Mr. Luxton said.

Great apes

The Bill also provides greater restrictions on the use and interaction with great apes. Research, testing or teaching involving the use of a great ape can only be approved by the Director-General of Ministry of Agriculture and Fisheries who must first be satisfied that any likely benefits are not outweighed by harm to the great ape.

"This requirement recognises the advanced cognitive and emotional capacity ofgreat apes. New Zealand is the first country in the world to legislate in this way. This is a small but nevertheless important step," Mr Luxton said.

Hunting and fishing

This Bill does not impose regulatory controls on the activities of hunting, fishing and pest control. To do so could have significant social and economic effects and these issues have not been subject to adequate public debate. "I would encourage those interested groups to develop voluntary codes of practice in conjunction with the National Animal Welfare Advisory Committee."

Tail docking

On the issue of docking dogs' tails Mr Luxton said it was an issue that has been subject to significant debate.

"The Select Committee examined the issues very carefully. The debate shows no clear consensus on the issue. It is clearly a difficult one to resolve as it involves quite strongly held ethical and philosophical views. We could not afford to let the issues of docking dogs tails stand in the way of passing this important Bill through the House."

"Animal welfare is an important strategic marketing issue and of growing importance to international trade. New Zealand's animal welfare reputation is likely to play an increasing role in consumer perceptions and ultimately their choices of our agricultural products. Codes of welfare will be a progressive addition to the legislation, and will assist New Zealand to provide assurances to our trading partners," Mr. Luxton concluded.

The Animal Welfare Act of 1999 is on the web at
http://www.maf.govt.nz/MAFnet/
publications/awguide/httoc.htm

New guide on care of animals in the classroom launched

A new guide on how to care for animals in the classroom has been launched.

Attitudes towards animals are formed early in life. For many, school may be the place where experience on how to handle and look after animals is gained, and provides opportunities for detailed observation of animal behaviour and growth.

The guide, "Caring for Animals – A Guide for Teachers, Early Childhood Educators, and Students", explains the proper care of axolotls, goldfish, terrapins, birds, guinea pigs, rabbits, rats, mice, and other animals.

The new guide explains both the ethical and legal obligations for boards of trustees, teachers, early childhood educators, and students, whether they are observing or studying the animal. It also outlines the needs of various invertebrates and vertebrates to ensure they remain healthy and well cared for.

Contributors to the guide include the Ministry of Education, the Ministry of Agriculture and Forestry, the Animals in Schools Education Trust (a charitable trust set up by the New Zealand Veterinary Association), and the Australian and New Zealand Council for the Care of Animals in Research and Teaching (ANZCCART).

This publication is available at a cost of $8.95 per copy.

For further information or to order a copy please contact: Learning Media Ltd, P O Box 3293, Wellington, New Zealand. phone: 0800 800 565 or fax: 0800 800 570

Edinburgh Zoo wins 1999 UFAW Zoo Animal Welfare Innovation Award for Penguin Cone Feeder

The 1999 UFAW (Universities Federation for Animal Welfare) Zoo Animal Welfare Innovation Award was won by Edinburgh Zoo for their Penguin Cone Feeder. The Penguin Cone Feeder is used to deliver fish in a controlled manner to the zoo's population of gentoo, king, marconi, and rockhopper penguins while they are underwater. Seeking to get away from hand feeding on land and interested in encouraging their penguins to show natural underwater feeding, Edinburgh zookeepers modified a traffic cone so that its tip is just large enough to allow their fish of choice, herring, to pass through. The cone is then filled with fish and suspended upside down in the main penguin pool, allowing the head of the first fish to protrude slightly from the tip of the cone. Any penguins seeking to feed have to swim underneath the cone and remove each fish individually. The cone feeder reduces the problem of unwanted fish sinking to the bottom of the main pool and polluting the water that commonly occurs if multiple fish are thrown into the water for the penguins to feed on, and stops herring gulls competing with the penguins for the fish. The cone feeder has proved very successful and studies pre and post-enrichment have shown that the penguins increase the amount of time in the water, and increase natural feeding and foraging behavior such as porpoising.

Policy #29 —Farm Animals Used for Nonagricultural Purposes —February 11, 2000

References: Animal Welfare Act (AWA) Section 2, 13, and 9 CFR, Part 3, Subpart F

History:

This is a new policy. Farm animals used in activities regulated under the AWA are maintained in both agricultural and nonagricultural environments. Animal Care inspectors, the research and exhibition communities, as well as other members of the public, have requested that we provide more specific guidance than what the regulations contain for the humane care of farm animals used in regulated activities.

Justification:

The AWA authorizes APHIS to regulate farm animals, such as cattle, sheep, pigs, and goats, when the animals are used for biomedical or other nonagricultural research or nonagricultural exhibition. In light of the increased use of farm animals for covered purposes and because the needs of farm animals can be different from other kinds of animals typically used in research and exhibition, we developed this policy.

Policy:

This policy offers guidance on how regulated entities can comply with the standards in the regulations as they apply to farm animals. Animal Care has adopted two guides, the *Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching,* published by the Federation of Animal Science Societies, and the *Guide for the Care and Use of Laboratory Animals,* published by the Institute for Laboratory Animal Research (ILAR). The two publications are commonly known as the *Ag Guide* and the *ILAR Guide*, respectively. We adopted these two specific guides because they represent the most current scientific information available on handling, housing, care, treatment, and transportation of farm animals for nonagricultural purposes. They are widely used, are the most complete guides available, are relatively inexpensive and easily obtained, and are being used by most institutions that receive funding from the Public Health Service or are accredited by the Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC International).

The Ag Guide contains recommendations to ensure the humane care of farm animals that are maintained in agricultural or typical farm-like settings. It contains principles that apply to all farm animals, as well as species specific recommendations.

The ILAR Guide is a general guide that recommends practices that may be applied to the care and use of farm animals when they are housed in typical laboratory settings.

Regulated entities may use applicable sections of the guides to supplement their understanding of how to meet the standards in the regulations. Use of these guides should help ensure consistent enforcement by Animal Care inspectors.

Adoption of these guides is intended only as additional guidance on how to meet the already existing standards in the regulations. They are to be used only to supplement or interpret the regulations. Both guides contain recommendations concerning animals such as poultry and areas such as environmental enhancement and individual animal identification that are not covered or required under the regulations. Those portions of the guides that do not relate to or support the current standards in the regulations cannot be enforced by Animal Care inspectors. At the same time, nothing in the guides will be used to reduce or lessen any of the requirements in the current regulations.

As there are other published guides, as well as other sources of information that provide recommendations on the humane care of farm animals in various settings, licensees and registrants may use recommendations from other sources, as long as the chosen practice satisfies the standards in the regulations.

All Animal Care inspectors have been provided these guides; however, since they are not published by APHIS, we cannot provide copies to the public. To obtain a copy of the Ag Guide or ILAR Guide contact the the following:

Ag Guide: Federation of Animal Science Societies, 111 North Dunlap Avenue 2101 Savory, IL 61874, phone: (217) 356-3182 ($10 per copy)

ILAR Guide: National Academy Press, Constitution Avenue NW, Lock Box 285, Washington, DC 20055, phone: (800) 624-6242 (U.S. only) or (202) 334-3313 ($9.95 per copy) ■

Field Study Definition Revised in Animal Welfare Act

[Federal Register: February 9, 2000 (Volume 65, Number 27)]
[Rules and Regulations]
[Page 6312-6314]
Department of Agriculture
Animal and Plant Health Inspection Service
9 CFR Part 1
[Docket No. 98-043-2]
Field Study; Definition
AGENCY: Animal and Plant Health Inspection Service, USDA.
ACTION: Final rule.
SUMMARY: We are amending the Animal Welfare regulations by clarifying the definition of the term field study. We will clarify that a field study cannot involve an invasive procedure, harm the animals under study, or materially alter the behavior of the animals under study. As worded prior to this final rule, the definition of field study could be interpreted to mean that a field study may include one of these situations. This action will help ensure the proper use and care of animals used in field studies. Accordingly, we are amending 9 CFR part 1 as follows:

PART 1—DEFINITION OF TERMS
1. The authority citation for part 1 continues to read as follows:
Authority: 7 U.S.C. 2131-2159; 7 CFR 2.22, 2.80, and 371.2(g).
2. In Sec. 1.1, the definition of field study is revised to read as follows:
Sec. 1.1 Definitions.
Field study means a study conducted on free-living wild animals in their natural habitat. However, this term excludes any study that involves an invasive procedure, harms, or materially alters the behavior of an animal under study.

EFFECTIVE DATE: March 10, 2000.

FOR FURTHER INFORMATION CONTACT: Dr. Jerry DePoyster, Senior Veterinary Medical Officer, Animal Care, APHIS, 4700 River Road Unit 84, Riverdale, MD 20737-1228; phone: (301) 734-7586, e-mail: ace@usda.gov

USDA DEVELOPING EMERGENCY PLAN FOR PETS IN DISASTERS

In September 1999, Hurricane Floyd displaced tens of thousands of animals throughout North Carolina and the southeastern United States. The U.S. Department of Agriculture sent experts into the field to assess damage to livestock herds, but learned that many of the animals affected were domestic pets.

"When I traveled to North Carolina with our emergency response teams, I was horrified to see the number of pets that had been harmed by the hurricane," said Michael V. Dunn, under secretary for USDA's marketing and regulatory programs. "In the flight of evacuation, pets were lost, left behind, and separated from their owners. Some shelters weren't equipped to handle animals and fleeing pet owners didn't know what to do with their dogs and cats."

"I realized that the USDA needed to develop a strategy not only to work with livestock and agricultural animals, but with companion animals as well."

Officials from USDA's Animal and Plant Health Inspection Service, along with under secretary Dunn, met with disaster planners from the Humane Society of the United States, the American Humane Association, and the American Veterinary Medical Association in November to discuss how best to secure the well-being of pets in disasters.

The meeting allowed USDA officials to examine the disaster strategies of various animal protection groups and discuss how the department can work with companion animals and their owners before, during, and after times of crisis.

"We are in the early stages of planning," Dunn added. "But we see a time when the USDA will help people and their pets reach a place of safety during an emergency."

Strategic Direction for the Animal Care Program

APHIS is continually evaluating the effectiveness of its AC programs and activities. The January 2000 Strategic Plan is solely reflective of the program supporting the Animal Welfare Act, gives updates of ongoing activities supporting the original tenets and initiatives, and offers suggestions for improving the program. These tenets are:

Enhance Statutory, Regulatory and Procedural Authorities.
Encourage Excellence in Animal Care.
Maximize Resources for Enhanced Program Delivery and Efficiency.
Respond to External Concerns and Expectations through Objective Action.
Empower, Support and Develop Employees.

The issues facing AC can be placed into four categories: dealers and exhibitors, research, transportation, and resources. Issues with regulated entities include effectiveness of penalties, pet theft, license renewal for chronic violators, nonhuman primat e enrichment, and identification of dangerous exhibited animals. Resource-related issues include cost increases under static appropriations, public understanding and awareness, and adopting industry standards. Available at http://www.aphis.usda.gov/ac/strategicplan.html

Congress cont'd from p.1

231(b) of this Act) is further amended by adding at the end the following:

Sec. 41721. Reports by carriers on incidents involving animals during air transport

(a) IN GENERAL- An air carrier that provides scheduled passenger air transportation shall submit monthly to the Secretary [of Transportation] a report on any incidents involving the loss, injury, or death of an animal (as defined by the Secretary of Transportation) during air transport provided by the air carrier. The report shall be in such form and contain such information as the Secretary determines appropriate.

(b) TRAINING OF AIR CARRIER EMPLOYEES- The Secretary shall work with air carriers to improve the training of employees with respect to the air transport of animals and the notification of passengers of the conditions under which the air transport of animals is conducted.

(c) SHARING OF INFORMATION- The Secretary and the Secretary of Agriculture shall enter into a memorandum of understanding to ensure the sharing of information that the Secretary receives under subsection (a).

(d) PUBLICATION OF DATA- The Secretary shall publish data on incidents and complaints involving the loss, injury, or death of an animal during air transport in a manner comparable to other consumer complaint and incident data.

(e) AIR TRANSPORT- For purposes of this section, the air transport of an animal includes the entire period during which an animal is in the custody of an air carrier, from check-in of the animal prior to departure until the animal is returned to the owner or guardian of the animal at the final destination of the animal.

(b) CONFORMING AMENDMENT- The analysis for such subchapter is further amended by adding at the end the following:

41721. Reports by carriers on incidents involving animals during air transportation.'

- **HR 2874 To amend the Wild Free-Roaming Horses and Burros Act to provide for delegation to States of the powers and duties under that Act regarding management of wild free-roaming horses and burros, and for other purposes.**

Introduced September 15, 1999, by Jim Gibbons (R-Nevada) and referred to the Committee on Resources. Subcommittee on National Parks and Public Lands hearings held on October 28, 1999. This Act may be cited as the "Wild Horse and Burro Preservation and Management Act of 1999."

SEC. 2. DELEGATION OF POWERS AND DUTIES TO STATES REGARDING WILD FREE-ROAMING HORSES AND BURROS.

Section 3 of the Wild Free-Roaming Horses and Burros Act (16 U.S.C. 1333) is amended by adding at the end the following:

(e) DELEGATION OF POWERS AND DUTIES TO STATES- Upon request of the Governor of a State, the Secretary [of the Interior] shall delegate to the State the powers and duties of the Secretary under this Act with respect to wild free-roaming horses and burros in the State.

SEC. 3. ALLOCATION OF FUNDS AMONG STATES.

The Wild Free-Roaming Horses and Burros Act (16 U.S.C. 1331 et seq.) is amended by adding at the end the following:

SEC. 12. ALLOCATION OF FUNDS AMONG STATES.

(a) IN GENERAL- Subject to section 13(b)(2), from the total sums available to carry out this Act each fiscal year that are not needed to administer adoptions of wild horses and burros under this Act, the Secretary shall allocate to each State an amount that bears the same ratio to those sums as the population of wild free-roaming horses and burros in the State bears to the total population of wild free-roaming horses and burros in all States.

(b) USE OF ALLOCATED AMOUNTS- Amounts allocated to a State under subsection (a) for a fiscal year shall be used only for activities under this Act in that State.

(c) TRANSFER OF ALLOCATED AMOUNTS TO STATE HAVING DELEGATED POWERS AND DUTIES- If the Secretary has delegated powers and duties to a State under section 3(e)—(1) the Secretary shall transfer to the State the amounts allocated to the State under this section; and (2) the amounts transferred may be used by the State only to carry out those powers and duties.

SEC. 4. NATIONAL MEDIA CAMPAIGN REGARDING ADOPTION PROGRAM.

The Wild Free-Roaming Horses and Burros Act (16 U.S.C. 1331 et seq.) is further amended by adding at the end the following:

SEC. 13. NATIONAL MEDIA CAMPAIGN.

(a) IN GENERAL- The Secretary of the Interior, acting through the Bureau of Land Management, shall conduct a national media campaign to increase public awareness of the wild free-roaming horses and burros adoption program under this Act.

(b) AUTHORIZATION OF APPROPRIATIONS- (1) IN GENERAL- There are authorized to be appropriated to the Secretary to carry out this section—(A) $2,000,000 for each of fiscal years 2000 and 2001; and (B) $1,000,000 for fiscal year 2002. (2) NOT SUBJECT TO ALLOCATION- Section 12 shall not apply to amounts appropriated under this section.

- **HR 2929 To amend title 18, United States Code, to prohibit certain conduct relating to elephants.**

Introduced September 23, 1999, Sam Farr (D-California) and referred to the Committee on the Judiciary. This Act may be cited as the "Captive Elephant Accident Prevention Act of 1999."

SEC. 2. ELEPHANT SHOWS AND RIDES.

(a) IN GENERAL- Chapter 89 of title 18, United States Code, is amended by adding at the end the following:

Sec. 1822. Elephant shows and rides

(a) Whoever, in or affecting interstate or foreign commerce, knowingly makes available any elephant for—(1) use in a traveling show or circus; or (2) the purpose of allowing individuals to ride that elephant; shall be fined under this title or imprisoned not more than 1 year, or both. In the case of a conviction of a person who has previously been convicted for another offense under this section, the offender shall be fined under this title or imprisoned not more than 2 years, or both.

(b) In this section, the term 'traveling show or circus' means a show or circus that spends most of its working time each year away from its permanent facility.

- **H.R.3078 To direct the Secretary of Commerce, acting through the National Marine Fisheries Service, to study the practice of shark finning in United States waters of the Central and Western Pacific Ocean and the effects that practice is having on shark populations in the Pacific Ocean.**

Introduced October 14, 1999, by Eni F.H. Faleomavaega (D-American Samoa) and referred to the House Committee on Resources. On October 19, it was referred to the Subcommittee on Fisheries Conservation, Wildlife and Oceans. Related bill H.R. 3535 introduced by Randy (Duke) Cunningham (R-California).

SECTION 1. FINDINGS.

The Congress finds the following: (1) Shark finning is the practice of removing the fins of a shark and disposing of its carcass. (2) Shark finning is wasteful, since fins typically comprise only one to five percent of a shark's bodyweight and 95 to 99 percent of the shark is disposed of. (3) The National Marine Fisheries Service has stated repeatedly that shark finning must be stopped, as it is contrary to the fisheries conservation and management policies of the United States under both domestic and international law. To that end, shark finning is already prohibited in the Federal waters of the Atlantic Ocean, the Gulf of Mexico, and the Caribbean, as well as in the State waters of many coastal States. (4) In the Central and Western Pacific Oceans, the number of sharks killed increased by more than 2000 percent between 1991 and 1998. Of the more than 60,000 sharks killed in such waters in 1998, more than 98 percent were killed solely for their fins. (5) The unique biological characteristics of sharks, including their slow rate of growth, their late sexual maturity, and the small number of offspring born per shark each year, make shark species particularly vulnerable to over-fishing. (6) The Western Pacific Regional Fishery Management Council and the National Marine Fisheries Service have completed a study of the socio-cultural importance of shark finning in the Western Pacific Ocean. (7) Shark finning is of some economic importance to the United States fishing industry in the Central and Western Pacific Ocean. (8) There is insufficient scientific data to determine if the current level of shark finning will result in a sustainable fishery.

SEC. 3. STUDY OF SHARK FINNING IN THE CENTRAL AND WESTERN PACIFIC OCEAN.

(a) STUDY- The Secretary of Commerce, acting through the National Marine Fisheries Service, shall study the practice of shark finning in United States waters of the Central and Western Pacific Ocean and the effects that practice is having on shark populations in the Pacific Ocean. The study shall include data collection and analysis regarding the following: (1) The types and number of sharks in United States waters of the Central and Western Pacific Ocean, and whether these numbers are relatively stable or changing significantly. (2) The types and number of sharks killed per year in such waters. (3) Any trends in current shark finning activity in those waters. (4) For each species of shark in such waters, the estimated level of shark kills that would produce the maximum sustainable yield. (5) How to best manage shark fisheries in such waters.

(b) REPORT- The Secretary shall report to the Congress the findings, conclusions, and recommendations of the study under subsection (a) by not later than October 1, 2000.

- **H.R.3266 A bill to direct that essential antibiotic drugs not be used in livestock unless there is a reasonable certainty of no harm to human health.**

Introduced November 9, 1999, by Sherrod Brown (D-Ohio) and referred to the Committee on Commerce. On November 17, it was referred to the Subcommittee on Health and Environment. This Act may be cited as the "Preservation of Essential Antibiotics for Human Diseases Act of 1999."

Amends the Federal Food, Drug, and Cosmetic Act to prohibit the subtherapeutic use of essential antibiotic drugs in livestock feed unless the Secretary of Agriculture determines there is reasonable certainty of no human health threat due to the development of antimicrobial resistance from such use.

- **H. R. 3514 To amend the Public Health Service Act to provide for a system of sanctuaries for chimpanzees that have been designated as being no longer needed in research conducted or supported by the Public Health Service, and for other purposes.**

Introduced November 22, 1999, by James C. Greenwood (R-Pennsylvania) and referred to the Committee on Commerce. Referred to the Subcommittee on Health and Environment on December 3. This Act may be cited as the "Chimpanzee Health Improvement, Maintenance and Protection Act."

"SEC. 2. ESTABLISHMENT OF NATIONAL SANCTUARY SYSTEM FOR FEDERALLY OWNED OR SUPPORTED CHIMPANZEES NO LONGER NEEDED FOR RESEARCH.

Subpart 1 of part E of title IV of the Public Health Service Act (42 U.S.C. 287 et seq.) is amended by inserting after section 481B the following section:

SANCTUARY SYSTEM FOR SURPLUS CHIMPANZEES

SEC. 481C. (a) IN GENERAL- The Secretary shall provide for the establishment and operation in accordance with this section of a system to provide for the lifetime care of chimpanzees that have been used, or were bred or purchased for use, in research conducted or supported by the National Institutes of Health, the Food and Drug Administration, or other agencies of the Federal Government, and with respect to which it has been determined by the Secretary that the chimpanzees are not needed for such research (in this section referred to as 'surplus chimpanzees').

(b) ADMINISTRATION OF SANCTUARY SYSTEM- The Secretary shall carry out this section, including the establishment of regulations under subsection (d), in consultation with the board of directors of the nonprofit private entity that receives the contract under subsection (e) (relating to the operation of the sanctuary system).

(c) ACCEPTANCE OF CHIMPANZEES INTO SYSTEM- All surplus chimpanzees owned by the Federal Government shall be accepted into the sanctuary system. Subject to standards under subsection (d)(3), any surplus chimpanzee that is not owned by the Federal Government shall be accepted into the system if the owner transfers to the sanctuary system title to the chimpanzee.

(d) STANDARDS FOR PERMANENT RETIREMENT OF SURPLUS CHIMPANZEES- (1) IN GENERAL- The Secretary shall by regulation establish standards for operating the sanctuary system to provide for the permanent retirement of surplus chimpanzees. In establishing the standards, the Secretary shall consider the recommendations of the National Research Council applicable to surplus chimpanzees that are made in the report published in 1997 and entitled "Chimpanzees in Research—Strategies for Their Ethical Care, Management, and Use."

(2) CHIMPANZEES ACCEPTED INTO SYSTEM- With respect to chimpanzees that are accepted into the sanctuary system, standards under paragraph (1) shall include the following:

(A) A prohibition that the chimpanzees may not be used for research. This subparagraph does not prohibit noninvasive behavioral studies of the chimpanzees, or medical studies conducted during the course of normal veterinary care that is provided for the benefit of the chimpanzees. (B) Provisions regarding the housing of the chimpanzees. (C) Provisions regarding the behavioral well-being of the chimpanzees. (D) A requirement that the chimpanzees be cared for in accordance with the Animal Welfare Act. (E) A requirement that the chimpanzees be prevented from breeding. (F) A requirement that complete histories be maintained on the health and use in research of the chimpanzees. (G) A requirement that the chimpanzees be monitored for the purpose of promptly detecting the presence in the chimpanzees of any condition that may be a threat to the public health. (H) A requirement that chimpanzees posing such a threat be contained in accordance with applicable recommendations of the Director of the Centers for Disease Control and Prevention. (I) A prohibition that none of the chimpanzees may be subjected to euthanasia, except as in the best interests of the chimpanzee involved, as determined by the system and an attending veterinarian. (J) A prohibition that the chimpanzees may not be discharged from the system. (K) A provision that the Secretary may, in the discretion of the Secretary, accept into the system chimpanzees that are not surplus chimpanzees. (L) Such additional standards as the Secretary determines to be appropriate."

Other sections of this bill provide for the acceptance into the system of nonfederal chimpanzees, establishment and operation of the system, composition and appointment of a Board of Directors, and Congressional reporting requirements.

- **H.R.4281 To establish wherever feasible, guidelines, recommendations, and regulations that promote the regulatory acceptance of new and revised toxicological tests that protect human and animal health and the environment while reducing, refining, or replacing animal tests and and ensuring human safety and product effectiveness.**

Introduced April 13, 2000, by Ken Calvert (R-California) and referred to the Committee on Commerce. No other information available at press time.

UPDATE

- **H.R.1887 To amend title 18, United States Code, to punish the depiction of animal cruelty.**

Introduced May 20, 1999, by Elton Gallegly (R-California) and signed by President Clinton on December 9, 1999, as Public Law No: 106-152.

SECTION 1. PUNISHMENT FOR DEPICTION OF ANIMAL CRUELTY.

(a) IN GENERAL- Chapter 3 of title 18, United States Code, is amended by adding at the end the following:

Sec. 48. Depiction of animal cruelty

(a) CREATION, SALE, OR POSSESSION- Whoever knowingly creates, sells, or possesses a depiction of animal cruelty with the intention of placing that depiction in interstate or foreign commerce for commercial gain, shall be fined under this title or imprisoned not more than 5 years, or both.

(b) EXCEPTION- Subsection (a) does not apply to any depiction that has serious religious, political, scientific, educational, journalistic, historical, or artistic value.

(c) DEFINITIONS- In this section—

(1) the term 'depiction of animal cruelty' means any visual or auditory depiction, including any photograph, motion-picture film, video recording, electronic image, or sound recording of conduct in which a living animal is intentionally maimed, mutilated, tortured, wounded, or killed, if such conduct is illegal under Federal law or the law of the State in which the creation, sale, or possession takes place, regardless of whether the maiming, mutilation, torture, wounding, or killing took place in the State; and (2) the term `State' means each of the several States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, and any other commonwealth, territory, or possession of the United States.

- **H. R. 2454 To assure the long-term conservation of mid-continent light geese and the biological diversity of the ecosystem upon which many North American migratory birds depend, by directing the Secretary of the Interior to implement rules to reduce the overabundant population of mid-continent light geese.**

Introduced July 1, 1999, by Jim Saxton (R-New Jersey) and signed by President Clinton on November 24, 1999, as Public Law No: 106-108.

Title I: Arctic Tundra Habitat Emergency Conservation -Arctic Tundra Habitat Emergency Conservation Act - Gives the force and effect of law to the rules published by the U.S. Fish and Wildlife Service on February 16, 1999, relating to use of additional hunting methods to increase the harvest of mid-continent light geese and the establishment of a conservation order for the reduction of such goose populations. Di-

rects the Secretary of the Interior, acting through the Director of the Service, to notify the public of the force and effect of such rules.

(Sec. 103) Makes such requirement applicable until the latest of: (1) the effective date of rules issued by the Service to control overabundant populations of such geese; (2) the date of the publication of a final environmental impact statement for such rules; or (3) May 15, 2001.

(Sec. 104) Directs the Secretary, no later than the end of such period, to prepare and implement a comprehensive, long-term plan for the management of mid-continent light geese and the conservation of their habitat. Authorizes appropriations.

- **S.1268 A bill to amend the Public Health Service Act to provide support for the modernization and construction of biomedical and behavioral research facilities and laboratory instrumentation.**

Introduced June 23, 1999, by Tom Harkin (D-Iowa). Passed the Senate on November 19, 1999, and sent to the House of Representatives. Referred to the House Committee on Commerce on January 27, 2000, and referred to the Subcommittee on Health and Environment on February 4. This Act may be cited as the "Twenty-First Century Research Laboratories Act."

This Act amends the Public Health Service Act with respect to: (1) biomedical and behavioral research facilities, adding congressional reporting requirements about the status of such facilities and the availability and condition of technologically sophisticated laboratory equipment, authorizing appropriations: and (2) construction programs for regional primate research centers, reauthorizing and extending them.

Reauthorizes on a permanent basis the Shared Instrumentation Grant Program. ■

Animal Management in Disasters

ISBN: 1556644191

This book for emergency management personnel and people in the animal care community is written by Sebastian Heath, VetMB, MPVM, who is perhaps the foremost authority on animal disaster management. In a crisp, clear, easy-to-read manner he presents information on animal management in natural and man-made disasters, such as hurricanes, tornadoes, heat and drought, wildfires, earthquakes, floods, winter storms, building fires, vehicular accidents, nuclear contamination, and hazardous spills.

The book is divided into 8 sections covering:

- myths and realities in disasters involving animals;
- Overview of hazards and precautions to be taken to minimize damage;
- A close look at businesses in the animal care industry--costs of disasters, preparedness and integration in the community emergency management plans;
- The structure and development of emergency management plans or systems;
- Principles of disaster relief;
- Management of animals in disasters;
- International poerspectives; and
- Appendices providing sample state and county disaster plans, summaries of state liability laws, important resources and contacts, and a proposed veterinary incident management system.

Numerous graphics and photos accompany the text and clearly illustrate the the described procedures, equipment, and principles. This valuable book should be in the hands of anyone who works with animals. The cost is $39.95. To order, call Mosby's at toll-free: (800) 426-4545, or e-mail: customer.support@mosby.com

Healthy Animals Now Online

The latest issue of *Healthy Animals*can be found at: http://www.ars.usda.gov/is/np/ha

This quarterly online newsletter compiles Agricultural Research Service news and expert resources on the health and well-being of agricultural animals and fish. The current issue highlights ARS aquaculture research.

Web browsers may want to bookmark the site as a resource for locating animal health experts. An index lists ARS research locations covering about 70 animal health topics. These range from specific diseases, such as Lyme disease, to broad subjects like nutrition, ,parasites, and vaccines.

The site also provides complete contact information for the more than 25 ARS research groups that conduct studies aimed at protecting and improving farm animal health. Each quarter, one article in "Healthy Animals" focuses on a particular element of ARS animal research.

To receive quarterly announcements of each new issue's arrival online, contact Kathryn Barry Stelljes, ARS Information, at (510) 559-6069 or by e-mail at stelljes@asrr.arsusda.gov.

Announcements...

MEETINGS

- International Course on Laboratory Animal Science

A 2-week intensive course on laboratory animal science is being held at the Department of Laboratory Animal Science, Utrecht University, The Netherlands from May 15-26, 2000. The objective is to present facts and principles essential for the humane use of animals and for the quality of research. The contents are in line with recommendations of the Federation of European Laboratory Animal Science Associations (FELASA) regarding training of animal researchers. The course may also be of interest to those who intend to set up a similar course at their location. Topics include alternatives, ethical aspects, euthanasia/humane endpoints, legislation, behavior and stress, protocols, primatology, anesthesiology, microsurgery, animal nutrition, and genetic monitoring.

For additional information contact Prof. Dr. L.F.M. van Zutphen, Department of Laboratory Animal Science, Faculty of Veterinary Medicine, P.O. Box 80.166, 3508 TD Utrecht, The Netherlands, phone: 31-30-2532033, fax: 31-30-2537997, e-mail: pdk@las.vet.uu.nl

- Measuring Behavior 2000: 3rd International Conference on Methods and Techniques in Behavioral Research

Measuring Behavior 2000 to be held in Nijmegen, The Netherlands, August 15-18, 2000, will offer a variety of ways to gather and exchange information. The program will consist of oral papers, poster sessions, demonstrations, special interest groups (SIGs), training sessions, user meetings, workshops, scientific tours, post-conference sight-seeing, and a pleasant social program. All presentations will deal with innovative methods and techniques in behavioral research. Validation of a new technique is an acceptable subject for a paper or poster. However, papers discussing applications of proven techniques do not belong at Measuring Behavior 2000. Presentations on physiological techniques are welcome, as long as there is a clear link with behavior.

Contributions are welcome on the following topics:

Behavioral recording; automatic data acquisition techniques; brain imaging and behavior; Biophone:emetry and behavior; behavior and physiology; acoustics, speech, language and behavior; behavioral analysis; behavioral models; and teaching behavior research methods.

For additional information, contact: Conference Secretariat, Measuring Behavior 2000, P.O. Box 268, 6700 AG Wageningen, The Netherlands, phone: +31-317-497677, fax: +31-317-424496, e-mail: mb2000@noldus.nl, WWW: http://www.noldus.com/events/mb2000/index.html

PUBLICATIONS, NEWSLETTERS, BOOKS, MODELS, AND MULTIMEDIA

- *Resources for Crisis Management in Zoos and Other Animal Care Facilities*

The American Association of Zoo Keepers' (AAZK) newest publication is now available. This reference work is an anthology of articles by 56 authors, from zoo keepers and veterinarians to zoo directors and public relations specialists.

The 424-page volume brings together information and resources for planning a crisis management program or for augmenting an existing program.

The cost is $45 for AAZK members and $60 for nonmembers with an additional $10 postage for orders outside the continental United States. Call Susan Chan at 1-800-242-4519, or send in your order to: AAZK Inc., 3601 S.W. 29th Street, Suite 133, Topeka, KS 66614.

- *Genetic Engineering and Animal Welfare: Preparing for the 21st Century*

Edited by J.C. Gonder, E.D. Prentice, and L. Russow, U.S. $40, contact Scientists Center for Animal Welfare, 7833 Walker Dr., Suite 410, Greenbelt, MD 20770-3229, phone: (301) 345-3500, fax: (301) 345-3503, e-mail: info@scaw.com

Contains chapters on transgenic mammals, IACUC review of genetic engineering protocols, xenotransplantation issues and guidelines, and ethical considerations related to animal use in genetic engineering.

- *Handbook of Chlorination and Alternative Disinfectants*

By G.C. White, ISBN 0471292079, 1569 pp., U.S. $195, contact John Wiley & Sons, Inc., One Wiley Dr., Somerset, NJ 08875, phone: (732) 469-4400, fax: (732) 302-2300

Seventeen chapters cover all aspects of chlorination and other disinfectants. Chapters discuss chemistry, dechlorination, hypochlorination, chlorine dioxide, ozone, bromine, ultraviolet radiation, and more. Also covers facility design.

- *Proceedings of the 4th National Symposium on Biosafety: Working Safely with Research Animals*

WWW:http://www.cdc.gov/od/ohs/sympsium/symp_idx.htm

Complete proceedings of a conference held in January 1996. Topics include biosafety issues related to xenograft transplantation, infectious risks in using baboons, emerging infections, face protection, containment devices, staff management and legal issues.

- *Human Anatomy Atlases on CD-ROM*

By J.W. Sundsten and K.A. Mulligan. For inquiries and orders, contact Health Sciences, Center for Educational Resources, Box 357161, Seattle, WA 98195-7161, phone: 206 685-1186, fax: 206 543-8051, e-mail: center@u.washington.edu

The Neuroanatomy Interactive Syllabus uses the 2-D and 3-D images in the Neuroanatomy Atlas and many others. It is organized into functional chapters suitable as a laboratory guide, with an instructive caption accompanying each image. It contains 3-D computer graphic reconstructions of brain material; MRI scans; tissue sections, some enhanced with pathways; gross brain specimens and dissections; and summary drawings. Chapters include Topography and Development, Vessels and Ventricles, Spinal Cord, Brainstem and Cranial Nerves, Sensory and Motor Systems, Cerebellum and Basal Ganglia, Eye Movements, Hypothalamus and Limbic System, Cortical Connections, and Forebrain and MRI Scan Serial Sections.

- **Orthopedic Teaching Models**

Sawbones, Pacific Research Laboratories, Inc., P.O. Box 409, Vashon Island, WA 98070, phone: (206) 463-5551, fax: (206) 463-2526, e-mail: info@sawbones.com

WWW: http://www.sawbones.com/index_usa.html

For over two decades Sawbones has provided models to further develop orthopedic surgical skills outside the operating room setting as a supplement to didactic instruction. Pacific Research designs and creates functional human and veterinary teaching models. Pre-cut fractures, osteoporotic bone or other special services can be provided upon request. Pathologies or

combinations of Sawbones other than those shown can be developed by Pacific Research Laboratories.

- **PVC Rat**

Microsurgical Developments, P.O. Box 2045, 6201 CC Maastricht, The Netherlands, e-mail: info@microdev.nl, WWW: http//www.microdev.nl

Microsurgical Developments has a plastic (PVC) life-sized rat model that allows for 25 surgical techniques. The rat has wide incisions in the abdomen, chest, and throat. Cavities below each opening have properly located plastic organs and vessels. Surgical procedures that can be simulated include anastomoses, cannulations, and transplantations. The rat comes with spare parts so tubes can be replaced. Anatomical parts include jugular vein, portal vein, renal vein, iliolumbar artery, thoracic duct, heart, and kidneys. PVC Rat comes with a video user guide and a computer program for animal monitoring. The program displays ECG as strip chart recordings that change dynamically, and the program asks the user to interpret and determine what to do such as add more anesthetic. The cost in the U.S. is $185.

- **Veterinary Drug Handbook, Third Edition, CD-ROM**

By Donald C. Plumb, ISBN 0813815282, U.S. $89.95, contact Iowa State University Press, 2121 S. State Ave., Ames, IA 50014-8300, phone: 1-800-862-6657, WWW: http://www.isupress.edu

The CD-ROM features more than 370 drug monographs, indexed by trade and generic names, as well as nonapproved human drugs, and information on prescription diets for cats and dogs. Contains a search engine for quick searches of the text, a hypertext linked index, and a hypertext linked table of contents. Also available in hardcopy as desk or pocket edition.

- **The Virtual Heart**

U.S. $65, Office of the Dean for Academic Programs, School of Veterinary Medicine, University of California, Davis, CA 95616, WWW: http://www.calf.vetmed.ucdavis.edu/software_site/software_HTML/software.html

A Macintosh software program (soon to be PC compatible) used by the UC Davis veterinary school shows realistic images of dissected and non-dissected hearts. Users can view the heart from various angles. By highlighting a particular structure or its name, users access extensive information about the structure. The program also includes waveform tracings and audio of normal and abnormal heart sounds, views of common cardiac pathologies, an animated sequence of the cardiac cycle, microscopic and electronmicrographic images of cardiac tissue, radiographs, and an annotated electrocardiograph. Short film sequences show conventional and Doppler ultrasonic scans and the animated cardiac cycle.

FROM THE NATIONAL AGRICULTURAL LIBRARY

- Agricultural History on the Internet: A Finding Aid
  http://www.nal.usda.gov/ref/history.htm
- Guide to Historical Research at the National Agricultural Library: The General Collection (SRB 94-02)
  http://www.nal.usda.gov/ref/history.htm
- Proposed rule for NAL Fees for Loans and Copying (*Federal Register*: August 16, 1999)
  http://www.nal.usda.gov/ref/userfees.htm

AVAILABLE ON THE WORLD WIDE WEB

- Animal Diseases
  http://www.mic.ki.se/Diseases/c22.html

A list of links to sites that focus on veterinary medicine. General sites cover ophthalmology, oncology, viruses, toxic plants, other fields, and organizations. Specific species sections cover diseases of primates, horses, cattle, sheep and goats, swine, dogs, raccoons, ferrets, cats, rabbits and rodents, insectivores, marine mammals, birds, reptiles, fish, frogs, arthropods, and invertebrates. Site produced by Karolinska Institutet, Library, Stockholm, Sweden.

- Biotechnobase
  http://www.elsevier/nl/locate/biotechnobase

A new bibliographic database available from Elsevier Science (producers of Embase). Scope includes agriculture, development of novel therapeutics, environmental science, food science, health care, microbial biotechnology, textiles, DNA fingerprinting, and more. Also available on DIMDI. Sample searches can be found on

- Feral Cat Coalition
  http://www.feralcat.com

This website is hosted by a San Diego-based coalition and contains many documents about trapping, taming, raising, health care, and management of feral cat populations.

- Government of Canada Internet Addresses
  http://canada.gc.ca/directories/internet_e.html

An extensive directory of Canadian Government offices.

- Guidelines for the Welfare of Animals in Experimental Neoplasia
  http://www.newcastle.edu.au/cwis/Admin/rb/animal/ACE28.html

Guidelines from the University of Newcastle Animal Care and Ethics Committee, Australia, intended to provide assistance to researchers in using the three Rs in cancer research and in the implementation of humane endpoints (approved 1998).

- Journal of Pharmacology/Experimental Therapeutics
  http://jpet.aspetjournals.org/cgi/reprint/289/2/1060.pdf

Abstracts and articles from the Journal of Pharmacology and Experimental Therapeutics.

- Model Organisms for Biomedical Research
  http://www.nih.gov/science/models

This NIH web site has been developed to let the research community know what national and international activities and major resources are being developed to facilitate biomedical research using animal models. The links provide information about the genomic and genetic resources that are available or being generated for specific animals and organisms. Also included is a link to funding opportunities.

- National Registration Authority
  http://www.affa.gov.au/nra/

Australian Government's registration for agricultural and veterinary chemicals. Includes links to registered product databases.

- Risk Analysis Tools
  http://clueless.ucdavis.edu/risk

Occupational health tips linked to a checklist of laboratory and wild animal species.

"Meeting the Information Requirements of the Animal Welfare Act"

The Animal Welfare Information Center (AWIC) of the U.S. Department of Agriculture, National Agricultural Library (NAL) has developed a 2-day workshop for individuals who are responsible for providing information to meet the requirements of the Animal Welfare Act. Representatives from NIH, Office of Protection from Research Risks, and USDA's APHIS, Animal Care will be available for questions and answers . The workshop will be held at NAL in Beltsville, Maryland.

The act requires that investigators provide Institutional Animal Care and Use Committees (IACUC) with documentation demonstrating that a thorough literature search was conducted regarding alternatives. An alternative is any procedure that results in the reduction in the numbers of animals used, refinement of techniques, or replacement of animals.

The objectives of the workshop are to provide:

- an overview of the Animal Welfare Act and the information requirements of the act.
- a review of the alternatives concept.
- a comprehensive introduction to NAL, AWIC, and other organizations.
- instruction on the use of existing information databases/networks.
- online database searching experience.

This workshop is targeted for principal investigators, members of IACUC's, information providers, administrators of animal use programs, and veterinarians. All participants will receive a resource manual.

The next workshops will be held on June 22-23 and October 26-27, 2000.

The workshop will be limited to 20 people, so please sign up quickly. There is no fee for the workshop. Please go to the AWIC website at http://www.nal.usda.gov/awic/news/newsinfo.htm for additional information and registration forms.

For more information, contact AWIC at phone: (301) 504-6212, fax: (301) 504-7125, or e-mail: awic@nal.usda.gov, or write to: Animal Welfare Information Center, U.S. Department of Agriculture, National Agricultural Library, 10301 Baltimore Avenue, Beltsville, MD 20705-2351 ■

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